FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor : STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1035. (No. 43. Vol. XX.) OCTOBER 25, 1928 [Weekly, Price 6d. Post free, 7d.

Flight

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2
Telephone : Holborn 3211. Telegrams : Truditur, Westcent. London.

Annual Subscription Rates, Post Free.
United Kingdom .. 30*s.* 4*d.* Abroad .. .. 33*s.* 0*d.**
* *Foreign subscriptions must be remitted in British currency.*

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1928
Oct. 7–28 International Aircraft Exhibition, Berlin
Nov. 1 .... Lecture, " Testing of Adhesives for Timber," by W. D. Douglas, before R.Ae.S.
Nov. 8.... Lecture, " Machinery Installation of R.101," by Wing-Com. T. R. Cave-Browne-Cave, before R.Ae.S.
Nov. 15.... Lecture, " Aeroplane Engines in Flight," by R. J. Penn, before R.Ae.S.
Nov. 22.... Lecture, " Weight of Aircraft," by Maj. T. M. Barlow, before R.Ae.S.
Nov. 29.... Lecture, " Production Problems," by F. Sigrist, before R.Ae.S.
Dec. 3–8.... International Aeronautical Exhibition, Chicago, Ill.

EDITORIAL COMMENT

IN the " Private Flying " section of this week's issue of FLIGHT reference is made to the subject of the future of the light aeroplane clubs when, in something like two years, the arrangements now in force are expected to terminate. It appears to be an " open secret " that the Air Ministry will not be prepared to support the clubs, at least on the present basis, after that time, and the question which is very naturally occupying those responsible for the management of the clubs is: What is to happen then ? Unfortunately there is no reason to believe that all the light aeroplane clubs will by that time be able to support themselves. A few fortunate enough to have wealthy members might be able to struggle along with generous assistance from such members, but the great majority of clubs would, we are afraid, have to close down if deprived of financial assistance.

Future of the Flying Clubs

Rumour has it that a very influential M.P., an ex-Air Minister, is organising a scheme whereby it would seem all civilian flying within the United Kingdom will be under the direct control of a monopoly company. Presumably some form of subsidy from the Government is contemplated, but instead of the Air Ministry dealing with the clubs direct, it will, if we are correctly informed, deal with this new monopoly company which, in turn, will manage the various clubs.

We cannot say that, on the basis of such information as has hitherto reached us, the idea appears to be very satisfactory. The least that can happen will be that the clubs will lose their individuality. We understand that it is held that the centralisation of management is expected to result in a saving. Exactly why this should be expected we fail to see. Each club will still have to have its secretary, instructors, ground staff of engineers, and so forth, and these are likely to cost as much as they do under present arrangements.

It is also rumoured that the new scheme contemplates the standardisation of machines. Any saving that might be effected by this—and we think it rather

problematic—would be more than offset by the retardation of progress that might be expected from the abolition of all competition. No machine is so good that it is not possible to produce a better one, and whatever type were standardised a more suitable one would inevitably sooner or later be put on the market.

We already have one monopoly company, and so far the experience is not such as to encourage the establishment of a second. The new scheme will bear watching very closely if we are to avoid getting ourselves into a position worse than if the clubs were abolished altogether.

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Another Tragedy

It is to be feared that yet another must be added to the list of valuable lives lost in an attempt to fly across the Atlantic. Comdr. MacDonald has now been missing for a week, and there can be little hope of him having been rescued by a vessel. The attitude of FLIGHT towards these flights is well known, and this particular one can only be regarded as foolhardy in the extreme. In spite of statements that have been made in the daily press to the effect that he had enough petrol for 35 hours, we know very well that nothing of the sort was the case. The very most that might have been hoped for from the 100 gallons carried would be 25 to 26 hours. Unless, therefore, he was favoured with a very strong following wind, the enterprise was far too much of a gamble, and the result is not surprising. A relatively slight deviation from the direct course would be sufficient to render the range of the machine inadequate.

As in so many similar cases, those who suffer most by these ill-considered and useless flights are the relatives left behind, and everyone will sympathise very sincerely with Mrs. MacDonald and her little son in their bereavement.

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Wapitis for Australia

Elsewhere in this issue Maj. F. A. de V. Robertson deals with the decision of the Australian Commonwealth, doubtless as a result of the report of Air Marshal Sir John Salmond, to standardise the type of aircraft known as a "General purpose" machine, and the actual type which has been selected as a start is the Westland "Wapiti" with Bristol "Jupiter" engine. In view of the popularity of this machine at home, the decision of Australia is not surprising, and the two firms concerned are to be congratulated on having been selected for the responsible task of re-equipping the R.A.A.F. The makers of the "Wapiti" have always shown plenty of enterprise and initiative, but not until comparatively recently have their efforts been rewarded with substantial production orders. That these have now materialised is no more than just reward for the lean times which the firm in question has passed through with such determination and faith in ultimate success.

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The Royal Air Force Memorial Fund

THE usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House on September 27. Lieut.-Comdr. H. E. Perrin was in the chair, and the other member of the Committee present was:—Sqdn.-Leader Douglas Iron, O.B.E. The Committee considered in all 13 cases, and made grants to the amount of £93 13*s.* 6*d.*

A meeting of the Executive Committee of the above Fund was held at Iddesleigh House on October 10, and in the unavoidable absence of Lord Hugh Cecil the chair was taken by the honorary treasurer, Sir Charles McLeod, Bart.

The usual financial resolutions were approved, the most important one concerning grants made by the Fund to ex-officers and airmen and their dependents, amounting in all to £3,617 7*s.* 2*d.*, this covered by a period of 15 weeks.

One particular item brought to the notice of the Committee was a very generous donation in three portions made to the Fund for its general purposes by the directors of the Carlton Theatre Co., 166–170, Wardour Street, W., amounting in all to £919 13*s.* 7*d.*, and representing takings at the box office at the Carlton Theatre on Sundays in connection with the production of the film "Wings."

The secretary informed the meeting that during the 15 weeks since the last Executive Committee meeting the Grants Sub-Committee, presided over by Lieut.-Comdr. H. E. Perrin, had dealt with 95 cases at their meetings, and that in the same period the secretary himself had dealt with 296 smaller cases in which he had made grants on behalf of the committee.

It was announced that the Vanbrugh Castle School, Blackheath, maintained by the Fund, had commenced its winter term on Saturday, September 8, with 33 boys.

The secretary received instructions to carry out the ceremony of placing at the foot of the R.A.F. War Memorial on the Victoria Embankment the usual wreath on Armistice Day, particulars of the ceremony to be announced later.

A letter of resignation of his membership of the Executive Committee was read from Air Vice-Marshal Sir Robert Brooke-Popham, K.C.B., on his proceeding on November 1 to take over the command of His Majesty's Forces in Iraq.

Sir Robert Brooke-Popham has served on the Executive Committee of this Fund since its commencement, that is, a period of exactly nine years, and the Committee accepted his resignation with sincere regret.

The next meeting, as already fixed, will take place at the offices of the Fund on December 12, at 3 p.m.

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"At Home" at Filton

THE Bristol and Wessex Aeroplane Club held an "At Home" at the Filton Aerodrome, Bristol, on Saturday, October 20. Many visiting machines arrived. There were exhibitions of aerobatics and a landing competition in the form of an obstacle race. Prizes were offered for the latter. Joy-riding followed, and the assistance of visiting pilots for this was welcomed by the Club. Free petrol was provided. A dinner was held in the Grand Hotel, Bristol, in the evening. Sir Sefton Brancker flew down, and other flying visitors were Flt.-Lt. T. Rose, Capt. H. A. Brown, F/O. Penrose, Capt. H. Borad, and F/O. Parkhouse.

Lady Heath's Altitude Flight

THE Royal Aero Club announce that the altitude reached by Lady Heath on the D.H. Moth "Cirrus" III on October 4, 1928, was 5,731 m. (approximately 18,800 ft.).

Air Express to the Rescue

THE value of air express in an emergency was revealed rather strikingly at a recent sailing of the Canadian Pacific liner *Montnairn* from Quebec, at 3 o'clock in the afternoon. That same morning a passenger boarded the eastbound train at Montreal, but his hand baggage was placed by himself on a wrong train and when discovered by a conductor passing through the van it was returned at once to Montreal, reaching there at 11 o'clock—too late to make the liner in the ordinary course. In the circumstances, the passenger's representative at Montreal applied to the Canadian Pacific Express, by whom the luggage was sent on east by aeroplane, in a 2½-hr. flight, connecting in good time with the *Montnairn* at Father Point, to the joy of shipper and passenger alike.

Winter Air Mail Services

LETTER Air Mails between London and Holland, closing at G.P.O. at 12.15 p.m., were suspended for the winter on September 29. Air mails to Switzerland are despatched on Tuesdays and Thursdays. Mails to Lyons and Marseilles are now despatched by ordinary night mail to Paris, thence by air (arriving the afternoon after despatch). The supplementary letter mails despatched on Fridays by air to Marseilles to overtake the mails for Egypt, India, Australia, etc., have been discontinued. Afternoon air mails to Belgium and Germany have been suspended, but the morning air mails are still in operation.

Iraq Precautions

R.A.F. BASES at Samawa, Ur of the Chaldees, and Bussujeh, the centres of desert patrol, are being strengthened in view of probable new Wahabi raids on Iraqi frontier tribes.

(*Continued from page* 922.)

The Farman F. 190

As it was exhibited at the Paris Show in July, there is little need to give here a very detailed description of the Farman F.190 " Family Touring " or small passenger machine. It is, however, interesting to learn from the Farman representative on the French stand at the I.L.A. that the machine has now been flight tested, and that as a result of these tests seven machines have been ordered, thus marking in a small way the beginning of mass production.

The Farman F.190 is a high-wing, strut-braced monoplane mainly of wood construction, and fitted with one of the new Gnome-Rhone 230 h.p. " Titan " engines. The machine is of very neat appearance, and quite small and compact for its normal load of pilot and four passengers. The wing has a span of 14 m. (45 ft. 11 in.) and an area of 39 sq. m. (420 sq. ft.). The tare weight is 750 kg. (1,650 lbs.), and the permissible load of 850 kg. (1,870 lbs.) may be made up of 300 kg. (660 lbs.) of fuel and oil and 550 kg. (1,210 lbs.) of useful load in the form either of pilot and four passengers or pilot and freight to the equivalent weight. The ratio of useful load to tare weight is astonishing if these figures are correct. One almost suspects that the 1,210 lbs. of useful load must represent an overload, and that the normal useful load is much smaller. For instance, the weight of pilot and four passengers, assuming each to weigh 160 lbs., would only amount to 800 lbs. The top speed is given as 185 km. /h. (115 m.p.h.), and the absolute ceiling as 5,400 m. (17,700 ft.). With the amount of fuel quoted, the range is stated to be 800 km. (500 miles).

The Focke Wulf " Habicht "

In addition to the larger " Moewe " described last week, the Focke Wulf firm exhibit a small " feeder line " type of machine, the " Habicht " (Hawk), with Wright " Whirlwind " engine. The works series designation of this machine is A.20a, the " Habicht " being known, when fitted with a 120 Mercedes-Benz engine, as the type A.20, and as the A.28 when the power plant is the Bristol " Titan " engine. In either case the machine is of typical Focke-Wulf design : a cantilever monoplane with a wing of " Zanonia leaf " plan form, which is claimed to improve lateral stability, even at angles past the stall.

The cantilever monoplane wing is built entirely of wood, a large box-section spar forming the main structure, but the leading edge also being planked with ply-wood. The whole is afterwards covered with fabric. The fuselage has ply-wood covering over the cabin portion, and the forward part, engine mounting and pilot's cockpit, is aluminium covered. The small cabin has four seats, and as the machine is very low on the ground, entrance is direct through the door in the port side, without the use of steps. The pilot sits ahead of the wing, partly under the leading edge.

On the French stand : In the foreground the Nieuport-Delage commercial monoplane. In the extreme corner, a wing tip of the Potez 32. In the centre, the old Breguet "Nungesser-Coli." To the right of that the small Farman monoplane. And at the back, the Bleriot 111 and the fuselage of the Farman twin-engined machine.

A GERMAN "FEEDER LINE" TYPE: The Focke-Wulf "Habicht" is fitted with the Wright "Whirlwind" engine.

The undercarriage is similar to that of the "Moewe," *i.e.*, with axles and radius rods hinged to the lower longerons and vertical struts to the leading edge of the wing, inside which are the rubber cords which absorb the landing shocks.

The Wright "Whirlwind" engine is mounted in the nose, with the two petrol tanks housed, one on each side, inside the leading edge of the wing, giving direct gravity feed to the carburettor.

The main dimensions of the "Habicht" are: Length o.a., 10·2 m. (33·5 ft.); wing span, 16 m. (52·5 ft.); wing area, 32 sq. m. (344 sq. ft.). The tare weight of the machine is 1,000 kg. (2,200 lbs.); permissible load, 600 kg. (1,320 lbs.); total loaded weight, 1,600 kg. (3,520 lbs.). Maximum speed, 170 km./h. (105 m.p.h.); cruising speed, 150 km./h. (93 m.p.h.); landing speed, 80 km./h. (50 m.p.h.). Climb to 1,000 m. (3,280 ft.) in 5·4 mins. Ceiling 5,500 m. (18,000 ft.). Range, 650 km. (400 miles).

A type GL 22 is also exhibited, but as this is not strictly speaking a commercial machine, it will be dealt with later under various types that cannot readily be classified.

The Nieuport-Delage Type 640

A newcomer in the "feeder line" class at Berlin is the Nieuport-Delage type 640 exhibited by the Nieuport-Astra firm. Designed for use either as a passenger machine or a small goods carrier the type 640 is a high-wing monoplane with wing of elliptic plan form and bi-convex section, tapering in thickness from root to tips.

Like most small passenger monoplanes of recent production, the Nieuport-Delage 640 is designed to carry four passengers, and the pilot is placed ahead of the wing, behind a sloping windscreen, the function of which is the double one of protecting the pilot and deflecting the air upwards over the wing so as to avoid eddy making.

The cabin is somewhat small, and there is naturally not the 6 ft. headroom which one associates with larger passenger-carrying machines. As the type 640 is not, presumably, intended for use on very long routes, this probably does not matter greatly. The seats are comfortable and the view not too bad, although the windows are not very large. The cabin is entered by a door in the port side, and there is also a door communicating with the pilot's cockpit. Aft of the cabin is a small luggage compartment, the door of which is of very shallow depth, but ample width, and placed in the starboard side. This door is fastened by "meat skewers" in the old-fashioned way.

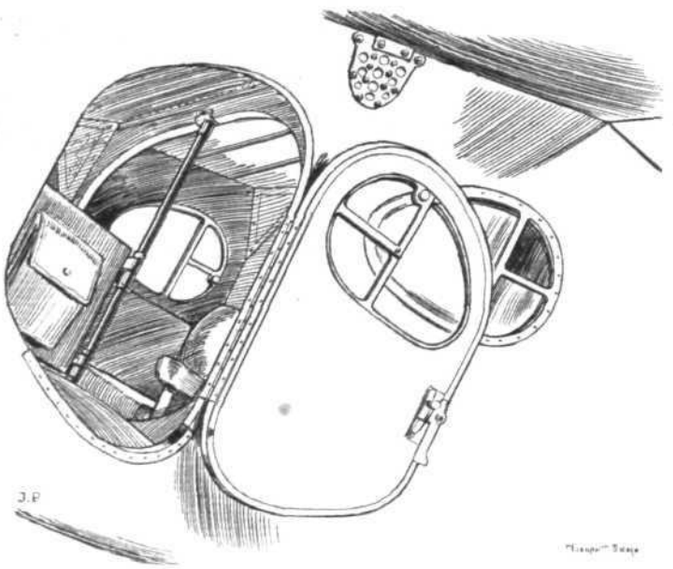
The Nieuport-Delage 640 is of all-wood construction, even the wing being covered with ply-wood. The rear portion of the fuselage is covered with a single thickness, but the cabin walls have a double thickness of ply-wood covering.

As already mentioned, the monoplane wing is of elliptic plan form. It is claimed that this, in conjunction with a large

Nieuport-Astra at Berlin: The Nieuport Delage type 640 is also a "feeder line" type of very compact design. The engine is a Wright "Whirlwind."

span, makes the wing very efficient and helps to give a large surplus of power.

The undercarrigge is of the " Split " type, and is somewhat unusual in that the radius rods and bent axles are

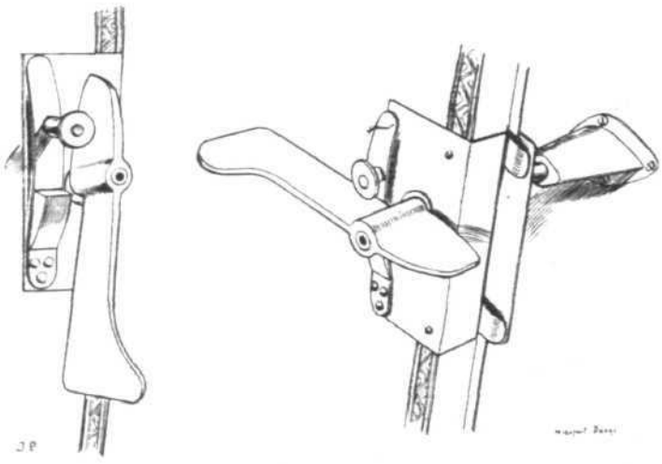


["FLIGHT" *Sketch*

The cabin of the Nieuport-Delage type 640 has four seats, and is entered through a door of rather small dimensions.

hinged to the centre line of the fuselage floor, while the telescopic member runs to the lower longeron. The shock absorbing medium is in the form of rubber blocks working in compression.

The engine fitted in the actual exhibition machine is a Wright " Whirlwind," but it is stated that any radial air cooled of from 230 to 300 b.h.p. can be fitted if desired, the engine mounting being designed as a complete unit, attached to the main fuselage structure at four points only.



["FLIGHT" *Sketch*

A SAFETY DEVICE : The door handle on the Nieuport-Delage is provided with a neat catch which prevents accidental opening of the door during flight.

The main dimensions of the Nieuport-Delage 640 are: length over all, 9·45 m. (31 ft.) ; wing span 15·4 m. (50·5 ft.); wing area, 30·87 m² (332 sq. ft.). The tare weight is 1,050 kg. (2,310 lbs.), and the permissible load of 700 kg. (1,540 lbs.) is made up as follows : Fuel and oil, 200 kg. (440 lbs.) ; general equipment 40 kg. (88 lbs.) ; disposable load, 460 kg. (1,012 lbs.) Total loaded weight, 1,750 kg. (3,850 lbs.). The maximum speed near the ground is 192 km./h. (119 m.p.h.), and the cruising speed 130 km./h. (81 m.p.h.). The landing speed is given as 84-92 km./h. (52-57 m.p.h.). Climb to 1,000 m. in 5 mins. 12 secs. To 4,000 m. (13,100 ft.) in 31 m. 30 secs.

The Henry Potez 32

This machine was exhibited at the last Paris Aero Show, and is a four-passenger commercial monoplane with 230 h.p. radial engine (Salmson, Lorraine or Wright). Owing to the fact that its cabin affords rather more head room than is usual in a " feeder line " type of machine, the Potez 32 has the appearance of being larger than it really is. The four seats in the cabin are staggered in relation to each other, while there is a fifth seat next to the pilot " up in front." The tare weight of the machine is, with Salmson A.B. 9 engine, 950 kg. (2,090 lbs.), and the load carried consists of fuel, 200 kg. (440 lbs.) ; useful load, 600 kg. (1,320 lbs.) ; total, 800 kg. (1,760 lbs.) ; total loaded weight, 1,750 kg. (3,850 lbs.). The length overall is 10·5 m. (34·4 ft.), and the wing span 14·5 m. (47·6 ft.). The wing area is 36·2 m.² (390 sq. ft.). Maximum speed at ground level 190 km./h. (118 m.p.h.) ; cruising speed, 160 km./h. (100 m.p.h.). Range at cruising speed, 800 kms. (500 miles).

LIGHT 'PLANES AT THE I.L.A.

As was perhaps to be expected, the nation which exhibits by far the greatest number of light aeroplanes is Germany, where the restrictions imposed until relatively recently prevented all but low-powered aircraft from being produced, and where in consequence a determined effort was made to produce machines with very small engines and yet capable of doing really serious work. In England we rapidly got away from the ultra-low-powered machine with which, some years ago, we first started the light 'plane movement. In Germany, on the other hand, the type still appears to survive, although the two-seater with an engine of round about 100 h.p. is obviously gaining ground. A further divergence between German and English policy is to be observed in the fact that whereas Germany retains in her ultra-low-power class the two-seater ideal, we are just now discussing in this country the feasibility of reviving the type, but as a single-seater. While some amazingly good performances have been put up in Germany on machines with engines of 20 h.p. or so, it is likely that in this country we have become too accustomed to the speeds of the 80-100 h.p. class ever to rest satisfied with the speeds attainable with the small power units used in Germany. For cross-country flying against strong winds, the speed reserve is generally regarded as being insufficient. German designers have, however, succeeded in finding markets for the slower types.

The Albatros L68 c

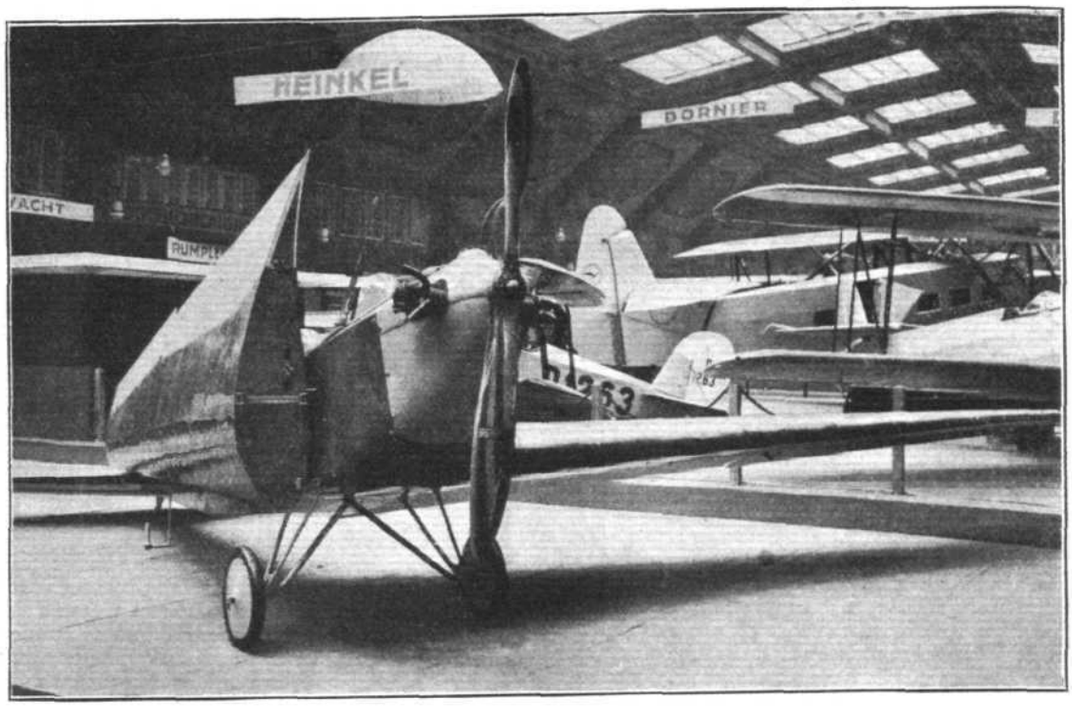
A very simple straightforward machine is the small two-seater light biplane exhibited by the Albatros-Flugzeugwerke. Known as the type L.68 c, this machine is characterised by a very pronounced stagger, but is in all other respects a perfectly normal biplane of " mixed " construction, *i.e.*, with steel-tube fuselage and wood wings. The wings are largely covered with ply-wood, *i.e.*, the entire under surface and the leading edge, while the top rear portion of each wing is fabric covered. The engine fitted as standard is the Siemens S.H.12 radial air-cooled of a normal power of 120 b.h.p. It is, however, stated that other engines of approximately the same power and size can be substituted if desired. An engine mounting of the swivelling type is used in order to facilitate access to the back of the engine.

The L.68 c is reported to be very manœuvrable and to have good controllability, thus being suitable not only for school work but also for practising aerobatics, etc. The tail plane is of the trimming type, a feature not always found in German aircraft of this small size and power, and the undercarriage is also up to the best modern standard, with rubber compression blocks absorbing the shock, and oil damping preventing bouncing.

Following are the main characteristics of the Albatros L.68 c. :—Length o.a., 6·48 m. (21·25 ft.) ; wing span, 10·10 m. (33·1 ft.) ; wing area, 25 sq. m. (269 sq. ft.). Tare weight, 595 kg. (1,310 lbs.) ; permissible load, 280 kg (615 lbs.) ; total loaded weight, 875 kg. (1,925 lbs.). Maximum speed, 135 km./h. (84 m.p.h.) landing speed 70 km./h. (43 m.p.h.). Climb to 1,000 m. (3,280 ft.) in 9·3 mins.

The B.F.W. Messerschmitt Light 'Planes

The Bavarian Aircraft Works of Augsburg exhibit two machines in the light 'plane class. Of these one is a two-seater biplane with Siemens S.H.11 engine, and the other is a

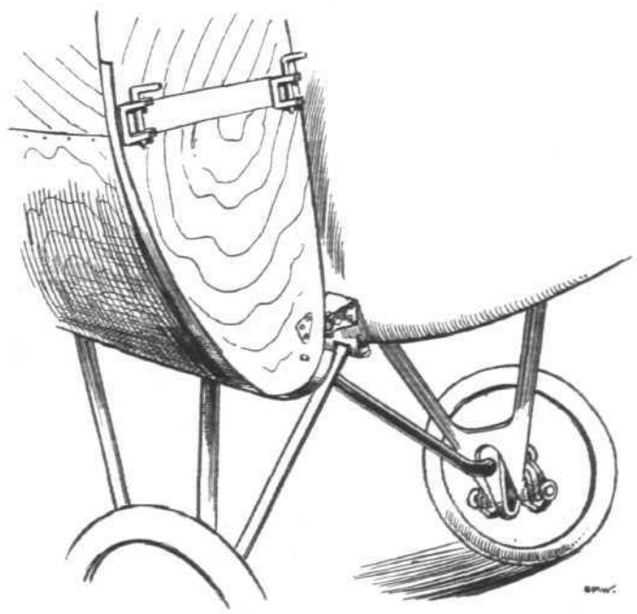


The B F.W. M23 low-wing monoplane with 20 h.p. Mercedes engine. Note the starboard wing carried on the side of the fuselage for transport.

low-wing monoplane two-seater with 20 h.p. Mercedes engine.

The B.F.W. type M.21 is an equal-span biplane designed for school work and aerobatics. Its aerodynamic design is perfectly normal (using the expression in the British sense) and the machine follows British practice in that the wings are designed to fold back, a feature not frequently found on German machines.

The flat-sided fuselage is of welded steel tube construction, without wire bracing, the struts being arranged diagonally to triangulate the structure. The wings are of wood construction, with ply-wood covering, but with normal interplane struts and wire bracing. As in British light 'planes the petrol tank forms the top centre-section, giving direct gravity feed to the carburettor. The cockpit arrangements are normal, with removable controls fitted in one cockpit so that when the machine is not being used for school work, the second set of controls can be taken out. The factors of safety are stated to be such that the machine may be used, in its two-seater form, for ordinary "stunting," while as a single-seater it is strong enough for the latest evolutions, such as the outside loop, etc.



["FLIGHT" *Sketch*

The wings of the B.F.W. M.23 are dismantled by undoing three catches, and are then carried on the sides of the fuselage.

The engine fitted in the B.F.W. M.21 is a Siemens radial, type S.H.11, but the designer informs us that if desired a different "nose" can be supplied to take the "Cirrus" engine.

Following are the main characteristics of the B.F.W. M.21: Length o.a., 7·32 m. (24 ft.); wing span, 10 m. (32·8 ft.); wing area, 20·8 sq. m. (224 sq. ft.) Tare weight, 460 kg. (1,012 lbs.); permissible load, 280 kg. (616 lbs.): total loaded weight, 740 kg. (1,628 lbs.); Maximum speed 145 km./h. (90 m.p.h.); cruising speed, 130 km./h. (81 m.p.h.). Ceiling, 3,300 m. (10,800 ft.). Range, 500 km. (310 miles).

The B.F.W. M.23 is of the low-power, low-wing monoplane type made familiar in recent years by the Klemm Daimler machines. Like these, it is fitted with the 20 h.p. Mercedes engine, and the ply-wood covered fuselage has its decking in the form of a sharp-ridged "roof."

The wings, which taper in plan form and thickness, are of the typical Messerschmitt single-spar construction, and this fact has been made use of in arranging the folding. The two wing halves are fitted to the fuselage by three quick-release devices, two of which are situated at top and bottom respectively of the main spar, the third being placed farther back in the section. After releasing the three catches the wing can be lifted off and placed on edge alongside the fuselage, where there are small brackets to support it.

The exhibition machine is fitted with the 20 h.p. Mercedes flat twin engine, but the A.B.C. "Scorpion" Mark II can also be fitted and gives a considerably better performance. Furthermore, it is stated that the structural strength of the machine is such that for special purposes an engine like the Armstrong-Siddeley "Genet" can be used.

The B.F.W. M.23 has the following main dimensions: length o.a., 6·9 m. (22·6 ft.); wing span, 11·83 m. (38·8 ft.); wing area, 14 sq. m. (151 sq. ft.). The tare weight is 200 kg. (440 lbs.) and the permissible load 210 kg. (462 lbs.), giving a total loaded weight of 410 kgs. (902 lbs.). The maximum speed with Mercedes 20-h.p. engine is given as 135 km./h. (84 m.p.h.), and the cruising speed as 110 km./h. (68 m.p.h.). The ceiling is 3,500 m. (11,500 ft.), and the range 500 km. (310 miles).

The Espenlaub Monoplane

For some peculiar reason, detail information concerning the little machine exhibited by Herr Espenlaub was difficult to come by. The machine is a parasol monoplane of all-wood construction, including the wing covering, designed to carry pilot and passenger. The wing, which is in one piece, is mounted on four ply-wood covered cantilever struts rising from the fuselage, and is attached thereto by four quick-release catches. For transport the wing is, presumably, detached and placed lengthwise, still resting on the four struts. The engine fitted is a 40 h.p. six-cylinder Anzani radial air-cooled. One of our photographs on the next page shows the general lines of the machine.

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The Espenlaub monoplane has its parasol wing supported on four cantilever struts. The engine is a 40 h.p. 6-cyl. Anzani.

The Klemm Light 'Planes

Generally of similar design and construction, the two light 'planes exhibited by Leichtflugzeugbau Klemm of Böblingen are both low-wing monoplanes mainly of wood construction, but whereas the type L.25 is a landplane with 20-h.p. Mercedes engine, the type L.25 W is a seaplane fitted with the little nine-cylinder Salmson radial air-cooled engine. The landplane is already familiar to readers of FLIGHT, having been described and illustrated last year when it paid a visit to Croydon, and the seaplane is, therefore, perhaps the more interesting of the two. It might be mentioned in connection with the landplane, however, that the fuselage is now entirely ply-wood covered.

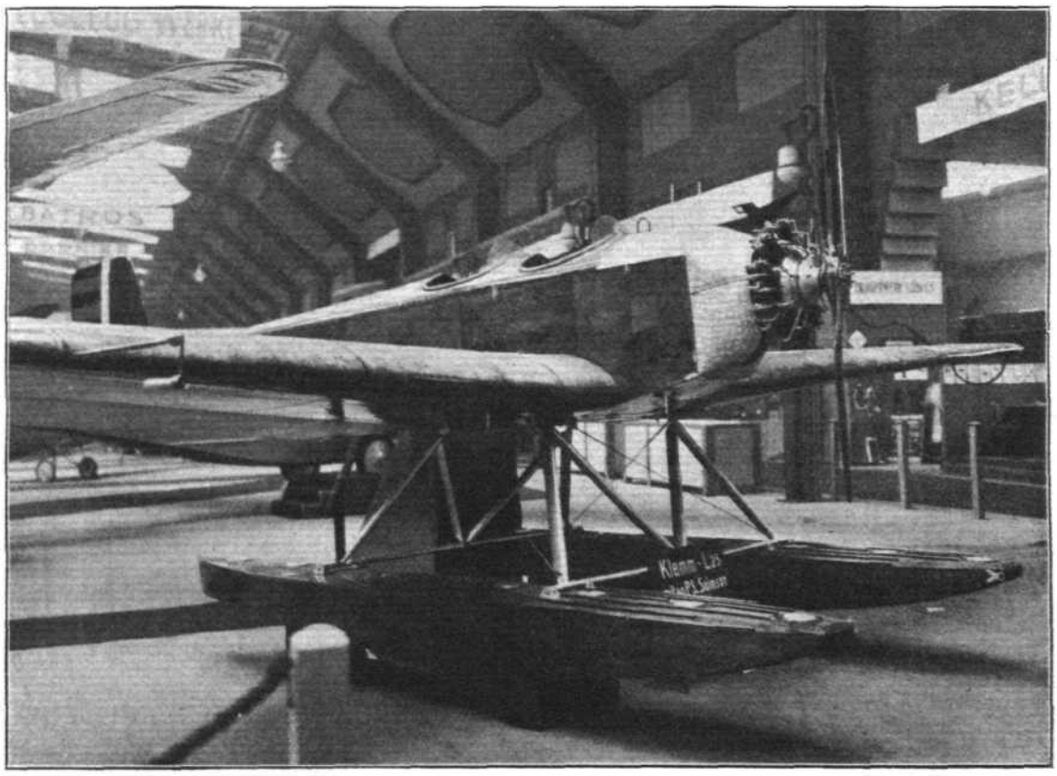
As long ago as 1919 the first Klemm-Daimler light 'plane was produced by Herr Regierungsbaumeister Hans Klemm at the Daimler works at Sindelfingen. This machine flew very well with a motor-cycle engine of only 12 h.p. The fact that the seaplane type shown at Berlin, the type L.25 W, has succeeded in getting "unstuck" with three on board indicates that the efficiency of the Klemm designs is very high. The machine is not, of course, designed to carry three normally, but on the occasion in question, M. Magnet of the Salmson company provided the "overload" (which was a very substantial one, M. Magnet probably weighing some 15 stone !).

Apart from the differences in undercarriage, and the small changes in the nose occasioned by the different engines, the two types exhibited have the same characteristics, *i.e.*, an all-wood fuselage, ply-wood covered, and low cantilever monoplane wings, also covered with ply-wood. Folding is not such a simple operation as on British light 'planes, as each wing-half has to be detached from the fuselage and, in order to get the lower wing surface against the fuselage, the port wing has to be carried over to the starboard side and vice versa.

A minor change is to be noted in the fuselage decking. Previously this was of the sharp-ridge "roof" type, but on both machines exhibited this has been altered to a slightly curved deck fairing more like those found on British light 'planes.

Both machines are well made and well finished, and both have a fairly large luggage compartment aft of the rear cockpit. The landplane is exhibited with this space occupied by a well-stocked picnic basket. It is interesting to learn that more than 100 of the Klemm light 'planes have now been built, and sold partly in Germany and partly outside.

No information is available concerning the dimensions of the two Klemm monoplanes, but following are the weights and performances of the L.25 landplane: tare weight, 265 kg. (583 lbs.); permissible load, 215 kg. (473 lbs.); total loaded weight, 480 kg. (1,056 lbs.). Maximum speed, 115 km./h. (71·5 m.p.h.); landing speed, 35-40 km./h. (22-25 m.p.h.), presumably according to whether the machine carries one or two occupants. The range is given as 700-1,500 km. (435-930 miles), the greater figure presumably representing the range when no passenger is carried and the weight thus



The Klemm L. 25 W seaplane is a two-seater with 40 h.p. Salmson engine. This machine has taken off the water with three on board. The float undercarriage is interchangeable with the landplane unit.

saved used for carrying extra fuel. With full load the ceiling is given as 4,000 m. (13,150 ft.), and with pilot only as 6,000 m. (19,700 ft.). The climb to 1,000 m. (3,280 ft.) is carried out in 14 mins. with two on board, and in 9 mins. with pilot only. The petrol consumption is given as 6-7 litres (1·3-1·5 gallons) per hour. Assuming that the machine cruises at 60 m.p.h., this gives a mileage of approximately 40-45 m.p.g.

The Klemm L.25 W seaplane with Salmson engine has a tare weight of 350 kg. (770 lbs.), and the permissible load is 250 kg. (550 lbs.), bringing the total loaded weight up to 600 kg. (1,320 lbs.). The maximum speed is given as 130 km./h. (81 m.p.h.), and the landing speed as 50 km./h. (31 m.p.h.). The range as single-seater and two-seater is 450-1,000 km. (260-620 miles), and the petrol consumption, 10-12 litres (2·2-2·64 gallons) per hour. The ceiling is 3,500 m. (11,500 ft.) with full load, and 5,000 m. (16,400 ft.) with pilot only. The machine is stated to get off the water in 18 seconds, and to climb to 1,000 m. (3,280 ft.) in 15 mins. with full load and in 8 mins. with pilot only.

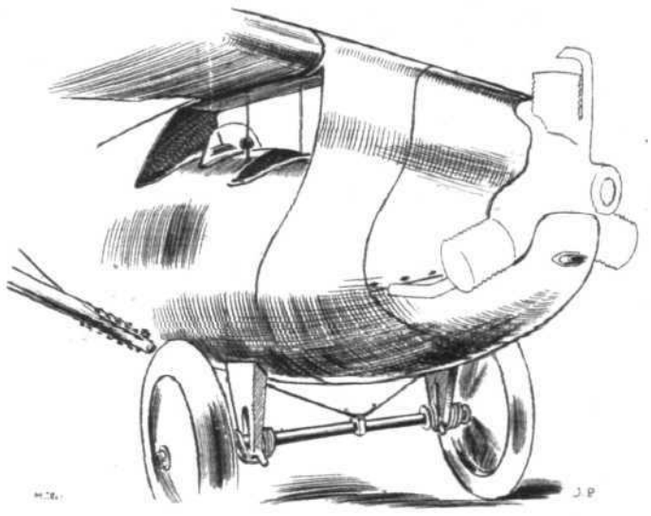
The floats of the L.25 W are of wood construction, and judging from photographs, the machine is very "clean" on the water.

The Müller Monoplane

We do not recollect having previously heard of Gebrüder Müller, of Griesheim, near Darmstadt, but evidently the firm has been in existence for some time, as the little monoplane exhibited is the second type to be produced, the first, type G.M.G. I, having been used by the Rhön-Rossitten Gesellschaft. The second machine, type G.M.G. II, is of somewhat unusual design, but shows excellent workmanship and a good finish.

Fitted with the old Anzani "Y" type of engine, developing some 30 h.p., the Müller monoplane has quite a respectable performance, and appears to deserve a better power unit. The performance figures given at the end of these notes are stated to have been determined by the Deutsche Versuchsanstalt für Luftfahrt, and may therefore be accepted as correct. In view of the low power, a top speed of 84 m.p.h. is by no means bad, while a climb to 3,280 ft. in 7·6 mins., with two on board, is very creditable indeed.

The G.M.G. II is of all-wood construction, the fuselage being covered with plywood, and the wing partly covered with this material, which extends from the leading edge to



["FLIGHT" *Sketch*

In the little Müller monoplane the roof of the fuselage runs across the cockpits, and the wing is attached to this "bridge." The undercarriage is somewhat elementary, and the narrow wheel track might result in "cartwheeling" on the ground in a strong wind.

back of the single main spar, the rest of the wing surface being fabric.

An unusual arrangement of wing attachment has been employed, the wing being bolted to a sort of bridge which runs over the top of the two cockpits. This bridge, which forms a part of the fuselage structure, is necessarily very strong in order to take the weight of the machine, and should offer good protection for the occupants in case the machine turns over on the ground, not an unlikely happening with the primitive undercarriage fitted to the machine. Another advantage of the "bridge" attachment of the monoplane wing is that it has become possible to provide doors to the two cockpits without seriously affecting the strength of the fuselage. Thus, although the wing is low over the ground, it is possible to step into the cockpits without the necessity for the acrobatic skill which is demanded in so many small aircraft.

Müller Brothers have adopted the wing construction which has become more popular in Germany than anywhere else: a single main spar which, with the ply-wood leading edge, forms a tube of "D"-section, said to be very strong in torsion, as well as in bending. In the Messerschmitt machines the wings thus built are pure cantilevers. In the Müller G.M.G. II, a single strut is used on each side to brace the wing. This means, of course, that although the bending stresses may be somewhat relieved by the use of a single strut, the torsional loads have to be taken entirely by the D-section spar.

The inverted "Y" type of Anzani engine lends itself particularly well to installation in this machine, because of the narrowing-in of the fuselage at the "bridge" and from it forward to the nose, the fuselage cross-section thereby assuming a form roughly conforming to the front elevation of the Anzani engine. The forward view thus becomes fairly good, although one would imagine that the rear cockpit at any rate must be fairly draughty. The petrol tank is placed in the upper portion of the fuselage, between the fireproof bulkhead and the front cockpit. The height is sufficient to give gravity feed, but one would have preferred to see the tank placed farther away from the engine and occupants.

The Müller G.M.G. II has an overall length of 6·16 m. (20·2 ft.) and a wing span of 11 m. (36·1 ft.). The wing area is 16 sq. m. (172 sq. ft.). Tare weight 275 kg. (605 lbs.); permissible load, 225 kg. (495 lbs.). Total loaded weight, 500 kg. (1,100 lbs.). The maximum speed is 136 km./h. (84 m.p.h.), and the cruising speed, 130 km./h. (81 m.p.h.). Landing speed, 60 km./h. (37 m.p.h.). Climb to 1,000 m. (3,280 ft.), in 7·6 mins. with full load, and in 4·5 mins. with pilot only. Duration at full throttle, 5 hrs., giving a range of 420 miles.

(To be continued)

A SOMEWHAT UNORTHODOX DESIGN: The Müller G.M.G. II has its monoplane wing attached to a "bridge" running over the top of the cockpits.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

October 25, 1928

CONTENTS

EDITORIAL VIEWS

The " Motor Cycle of the Air " has again become a subject for discussion, and it is felt that there exists now a definite need for a machine to sell at about £300, it being realised that this will be regarded as " the next best thing " for those keen on flying but unable to afford the price charged for a modern two-seater light 'plane. FLIGHT called attention to the subject some weeks ago, and since then a large amount of correspondence shows that large numbers of pilots or prospective pilots would be prepared to pay some £300 for a single-seater.

In this issue of THE AIRCRAFT ENGINEER, Mr. Clifford Tinson, who has for many years been on the design staff of the Bristol Aeroplane Company under Capt. Barnwell, outlines two designs for cheap machines which he has prepared, one as long ago as 1922, and the other last year. Unfortunately it has been necessary to divide Mr. Tinson's article, the concluding part of which will appear next month, but sufficient is included in the present issue to show that the £300 machine is a distinct possibility, provided the cheap engine of 30-40 h.p. can be found.

The designs speak for themselves, but we are a little doubtful as to the behaviour of such very tiny machines in " bumpy " weather, and it seems likely that they would be more difficult to fly than are existing machines.

Mr. Tinson's argument that the design should be tackled " as if one would have to find every penny, and do every ounce of labour oneself " is alluring, but it is possible to argue against it. What is a cheap form of construction in ones and twos may be expensive in quantities and conversely a form of construction may be very cheap in mass production which would be hopelessly expensive if built by hand. However, the two designs are certainly interesting, and it is to be hoped that a way will be found to enable Mr. Tinson to realise his dream of the £300 machine.

After an absence of two months (as far as " The Development of Metal Construction " is concerned), Mr. Pollard returns to our pages this week with an instalment in which he describes and illustrates relatively simple tools for the assembly into components of parts formed from flat steel ribbon. The tools described are not such as one would use for real mass-production, but they do provide a fairly cheap means of manufacturing relatively small quantities.

LIGHT SINGLE-SEATER AEROPLANES

By CLIFFORD W. TINSON, F.R.Ae.S., M.I.Ae.E.

The paragraph in Editorial Comment of FLIGHT, September 13, 1928, with reference to the possibilities of a cheap single seater aeroplane is very interesting, as I suppose most of those actively engaged in the aeronautical industry, at some time or other, have experienced an ambition to build such a machine.

It was in August, 1922, that I first gave the idea serious consideration, and a few particulars of the scheme may prove of interest. Except in the matter of choice of engine, I still think that the general lines on which it was proposed to work were sound from the point of view of the production of a really cheap aeroplane.

The predominating factors in the design were :—

(*a*) Reduction of size to a minimum.

(*b*) The adoption of a heavy skin to reduce the number of small parts.

It is unnecessary to say anything about reduction of size as the object of this is obvious. Regarding (*b*) I hope to show that the use of a comparatively thick three-ply skin for the wings, tail unit and fuselage is not unduly heavy, and is quite inexpensive if the surfaces have considerable curvature, as the number of subsidiary parts necessary is then very small.

With regard to the wings and tail unit, the shell is capable, shall I say, of carrying the load without spars. Light spars, however, are put in as well, the combination giving the necessary load factors. Additional to the skin and spars, a few light ribs are required to maintain the shape and to give stability to the shell. The spars alone are incapable of giving the full strength, so also is the shell, but the combination is designed to do so.

If this conception is feasible, it is a very simple matter to bend a sheet of 3-ply over formers of the aerofoil section, screw it down to them and to spars passed through slots in them.

Whilst it is not intended to exaggerate the idea of extreme simplicity, the foregoing explanation of the construction is intended to convey the general lines upon which it was proposed to proceed, as if the object is to reduce the expenditure both of time and money to a minimum, it is necessary to tackle the problem as if one would have to find every penny, and do ever ounce of labour, oneself. By getting this firmly in mind, every detail, as well as the main conception, will tend to a reduction of cost.

Such a construction would be quite out of the question unless the dimensions are very small : for example, it would

be impossible to construct a two-seater of normal dimensions on these lines without really considerable sacrifice of weight. On the other hand, if one followed normal practice, it is practically impossible to build so small a machine as that to be described without increasing the size of members above that indicated by calculation.

It follows, I think, that one must surrender a certain percentage of weight saving for cheapness, but provided the final result gives a performance equal to a predetermined standard, that does not matter, as it does not seriously affect running costs. The standard of performance which was fixed was as follows :—

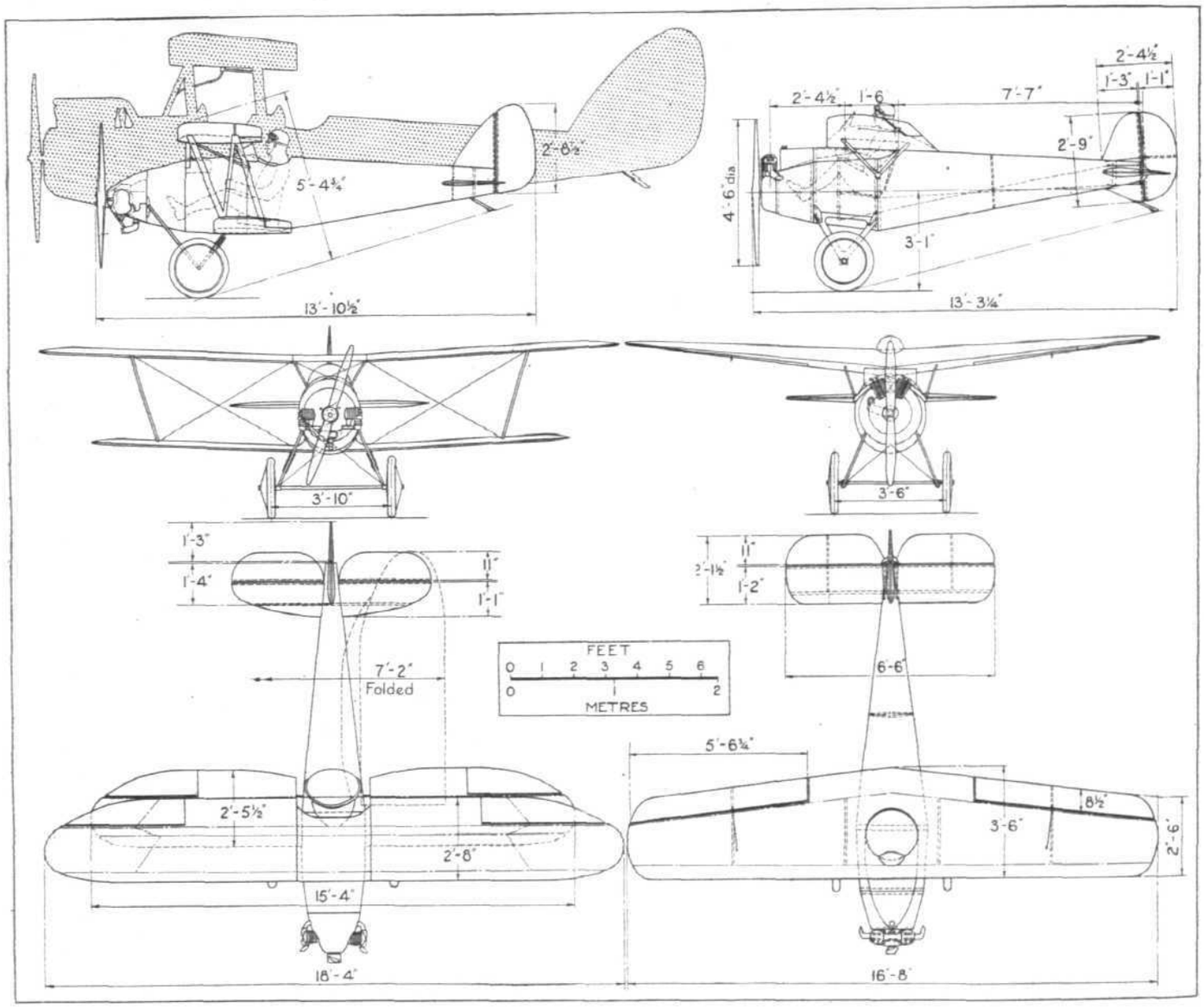
Landing speed not more than 40 m.p.h.
Maximum speed not less than 80 m.p.h.
Climb not less than 400 ft. per minute on the ground.

86 m.p.h. at Brooklands, came under consideration, and on enquiry from the makers produced the following particulars :—

Weight, 85 lb. ex magneto and carburettor.
Power, 26 b.h.p. at 3,000 r.p.m.
30 b.h.p. at 3,500 r.p.m.
Price, £42, less 10 per cent.

The price, power and weight fitted in well with the requirements of the scheme, and a small monoplane was then designed, allowing for pilot and 2 gallons of petrol only, the estimated total weight being 400 lb. This machine is shown on the right in the set of illustrations.

To give an idea of the machine, the span of which was 16 ft. 8 in., and the average chord 3ft., the length from the rear of the cockpit to the sternpost was only 7 ft. 7 in.,



THE "MOTOR CYCLE OF THE AIR": These three-view drawings show the two low-powered single-seaters designed by Mr. Tinson. The 1922 design for a monoplane with British Anzani engine is shown on the right, and the 1927 design for a biplane with Bristol "Cherub" is shown on the left. In order to give an idea of the small size of these machines, a side elevation of the De Havilland "Moth" is shown in the "shadow" behind the biplane elevation.

The figures estimated for the performance of the design drawn out exceeded the above and approximated to those for a Moth or Avian.

At the time of which I write, the difficulty was to obtain a suitable power unit. There were the Douglas, A.B.C., J.A.P. and Coventry Victor engines, none of which, with the possible exception of the Coventry Victor, would have given sufficient power to realise the performance required. The latter was quoted as 20 h.p. maximum, and the price £35 with magneto.

Shortly after, the British Anzani overhead twin motor-cycle engine, which had been consistently lapping at over

and from the front of the cockpit to the centre line of the cylinders was but 2 ft. 4½ in. The overall length was 13 ft. 3¼ in.

The fuselage was composed of three truncated cones, the first commencing at the engine plate and terminating at a point just ahead of the leading edge of the wing : length, 1 ft. 2 in. ; minimum diameter, 1 ft. 4 in. ; maximum diameter, 2 ft. The centre cone was 2 ft. long and 2 ft. 6 in. diameter at the big end. The tail cone was 8 ft. 3 in. long and tapered from 2 ft. 6 in. diameter to an oval section about 7 in. by 2¾ in.

The construction of the fuselage was to be of the simplest

possible type, consisting of 3-ply sheets rolled up into cones joined longitudinally by a cover strip riveted on. Anything simpler to construct would be difficult to imagine, and except where the cockpit opening occurs requires very little in the way of hoops or stiffeners to complete its rigidity, the tail cone—which is the longest—requiring perhaps one intermediate hoop of the lightest cross section for this purpose.

If very thin 3-ply were used it would be necessary of course to reinforce by a considerable number of hoops and longitudinal stringers; it was proposed, however, to use $\frac{3}{32}$-in. 3-ply throughout, which considered as a timber tube is strong enough without longerons.

The total area of three-ply for the fuselage shell was 56 sq. ft. which weighs barely 18 lb. and costs less than £3 for material.

It may be objected that such a construction is heavy for its job and that the use of thinner plywood with a few more internal stiffening members is desirable. It must be remembered, however, that when we get down to so small a size, rigidity is an important factor, and if the fuselage were built in the normal way with longerons, struts and wires, it would be necessary to use sections much above the theoretical requirements, otherwise a longeron would be damaged probably while the machine was being handled on the ground.

The cones were to be joined to each other by laminated hoops, the laminations being not more than $\frac{1}{8}$ in. thick, so as to be readily formable without steaming to the required shape, a web of three-ply being applied to one side to maintain the shape of the completed hoop against deformation. Metal straps 18 S.W.G. thick were to be provided to carry tension across the joint so that the screws fastening the skin were not subjected to too heavy a load.

The sternpost would be built into the end of the fuselage, being formed in one with the end bulkhead, a second bulkhead ahead of the sternpost being provided, to which to bolt the front spar of the tail plane. Both spars of the tail plane were to be slotted through the fuselage skin and bolted on to the face of the bulkheads.

The tail, elevators, fins and rudder would be covered with $\frac{1}{16}$ in. three-ply, and owing to the small dimensions and relatively large camber, these would require very little internally to maintain their shape and provide the necessary strength.

The forward end of the fuselage was to be closed by a bulkhead formed by glueing three-ply discs together to the necessary thickness, the bulkhead being fixed in place with a suitable number of angle plates. The engine was to have been bolted direct to this bulkhead.

Without going into any further detail, it will be seen that the material for the fuselage costs very little to buy, and the fuselage itself is very easily constructed without much in the way of assembly fixtures. On completion, it would form a strong and rigid unit weighing from 26 to 30 lb. complete.

The tail element, if composed of $\frac{1}{16}$ in. three-ply with light spars, would weigh about 10 lb. complete, and the cost of material—skin, spars, pieces of plate for levers, etc., would be in the neighbourhood of 35s.

The construction of the wings was to follow similar lines that is to say, the skin, being $\frac{3}{32}$ in. three-ply, is in itself a fairly strong beam, owing to the depth of the aerofoil and its camber, and requiring light spars only, in themselves incapable of giving the required load factors, but providing when assembled with the skin, a simple, strong and rigid unit.

The following is a list of the cost of materials required for the wing, and the estimated weights. The prices here given and stated elsewhere in these notes are bare cost, allowing nothing for wastage and scrap.

Wing Unit With Ailerons.

	Weight, lbs.	Cost. £ s. d.
Lower skin, main plane ...	11·0	2 0 0
Top skin, main plane ...	12·4	2 4 0
Front spar	10·4	4 0
Rear spar	11·2	4 3
End at aileron	0·286	6
Edging	3·960	9 0
Ring around cockpit ...	1·350	5 0
Attachment fittings ...	1·380	1 0
Aileron levers	2·250	1 3
Push rod	0·175	2 6
Aileron top skin	2·00	8 0
Aileron lower skin	2·00	8 0
Aileron spar	3·76	1 9
Aileron end piece	0·286	6
Aileron lever	0·404	3
Hinge eyebolts	0·540	2 0
Control cable	0·220	5 0
Paint and varnish	2·200	10 0
	65·811	£7 7 0

It will be noted that such a construction is not unduly heavy. As estimated, the weight of the wing unit comes out at 1·375 lb. per square foot, but assuming that the estimated weights are too low, due to an increased number of internal stiffeners being ultimately necessary, it could hardly exceed $1\frac{1}{2}$ lb./sq. ft.

(To be continued.)

DEVELOPMENT OF METAL CONSTRUCTION.

By H. J. Pollard, Wh.Ex., A.F.R.Ae.S.

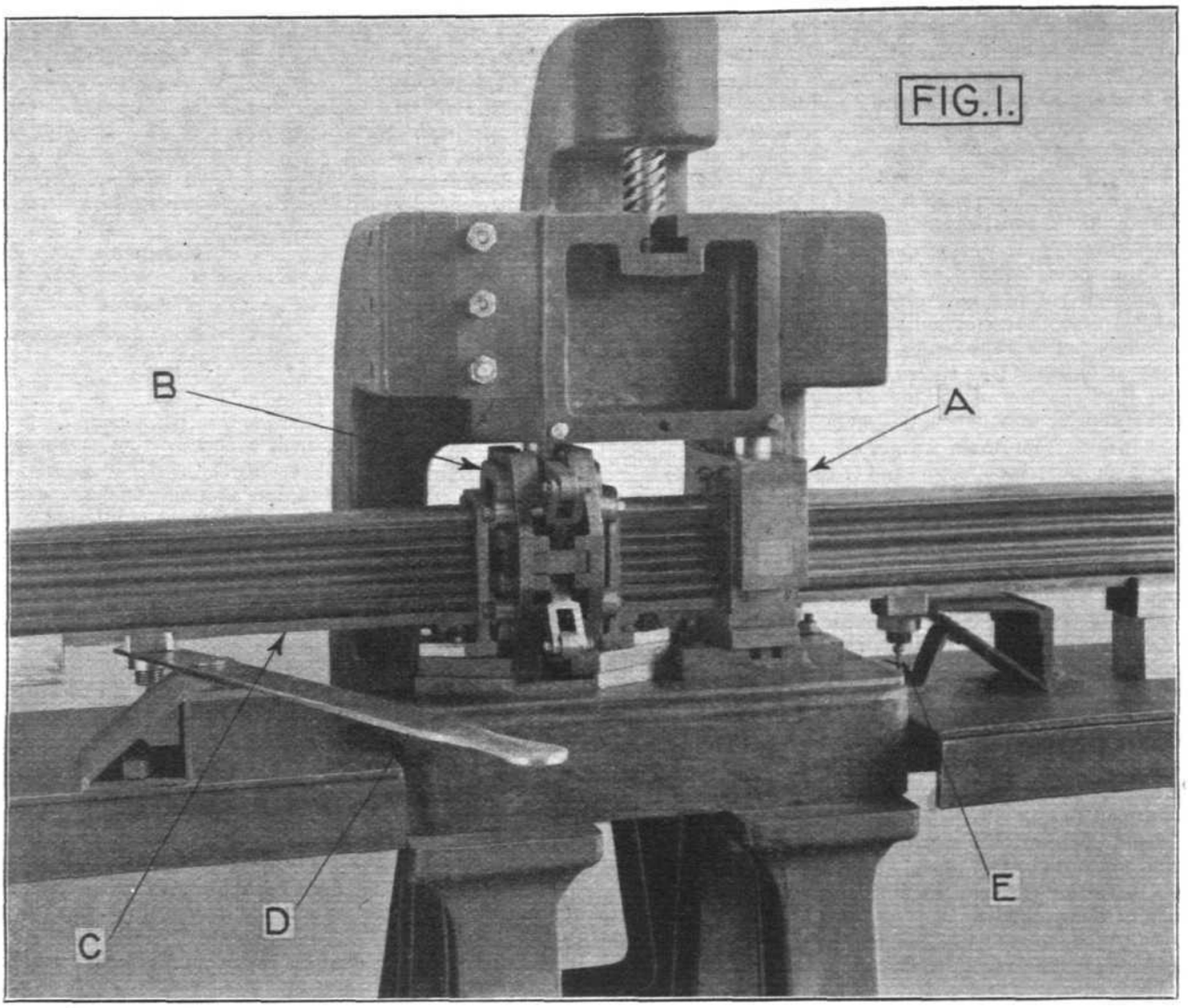
(Continued from p. 56.)

In the June and July issues of the Aircraft Engineer some methods of forming corrugated sections from metal ribbon were described. We now pass on to the assembly of these sections into structural members, and as a beginning deal with the building-up of wing or tail plane spars of the parallel box variety. It has been previously stated in these notes that owing to the existing small demand for aircraft, and to the constant changes in design, automatic machinery for the assembly of spars and similar members is at present out of the question, but sufficiently rapid production for present-day requirements has been obtained, in the case of the above-mentioned members, by such methods as are described below.

Fig. 1 shows a gang press equipped with a tool A, which pierces eight holes in the lips of spars, two in each of the four edges, and a tool B clinches the rivets which are put into place by hand in the clear space between the two tools. Both tools are actuated by one stroke of the press. The spar is carried along on bar C; there are holes in this bar spaced 2-in. pitch, and it is moved along by means of lever D, the spring loaded plunger E ensuring that the spar is moved along exactly 2 in. The punching tool follows straightforward lines, and little need be said about it beyond the fact that it is very important to ensure that the small "punchings" are carried away effectively from the tool; this may not, in all cases, be a very easy matter.

The clinching tool is rather more complicated. The "holding-up" portions must clearly come to rest under the heads of the eight rivets before the "up-setting" portion comes in contact with the rivet shanks. How this may be brought about is shown in Fig. 2, which is a section of the tool showing the spar in place; in order to give clearness to the explanation, the right-hand half of the sketch illustrates the position of the movable portions of the tool when the ram is at the top of its stroke, and the left-hand half their positions at the end of a down stroke.

F is the plug for attachment to the press crosshead. This plug is screwed into arm G. Downward movement of arm G causes links H_1 to rotate round pins I, the other end of the links giving a rectilinear motion to part J. This part slide in grooves machined in the body of the tool. To each pin N securing links H_1 to cam J is attached a link H_2. These links give vertical motion to the lower arm G_1. The sliding cam gives the correct motion to the rivet head support holders K. The sequence of motions can be plainly followed from the drawings. The curved ends of the cams come first



into contact with the sloping end of the " holding-up " tools ; during the first part of the stroke the upper and lower " holding up " tools are forced apart until the " sets " come in contact with the rivet heads ; provision is made, of course, against any endwise or lateral movement of the parts K. When the parts K are in position shown on the left-hand half of Fig. 2 the curved end of J is no longer in contact with the sloping end face of K and for the remainder of the stroke the horizontal faces of J and K are alone in contact ; therefore, no further vertical movements are given to parts K, but during the period these parts are in horizontal sliding contact arms G and G_1 are each still moving towards the centre of the tool by reason of the downward movement of the ram crosshead and links H_1 and H_2, as previously explained. These horizontal arms carry the " snaps " M. It is thus clearly seen how the correct motions are given to the eight holding-up punches O and the eight head-forming punches M. Only four such pairs of tools are to be seen in Fig. 2, but on the actual machine there are four more pairs, each at 1-in. pitch from those shown. On the up stroke, springs P bring holders K back to the position shown in right-hand half of the drawing.

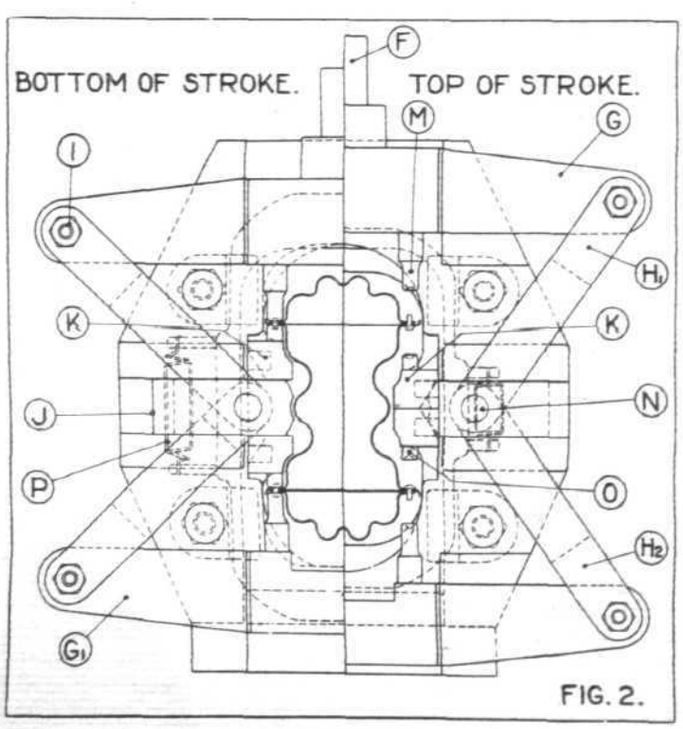


FIG. 2.

The punching tool is not so complicated as the riveting tool, as there is obviously no need to give motion to the die, only the punches need to be operated.

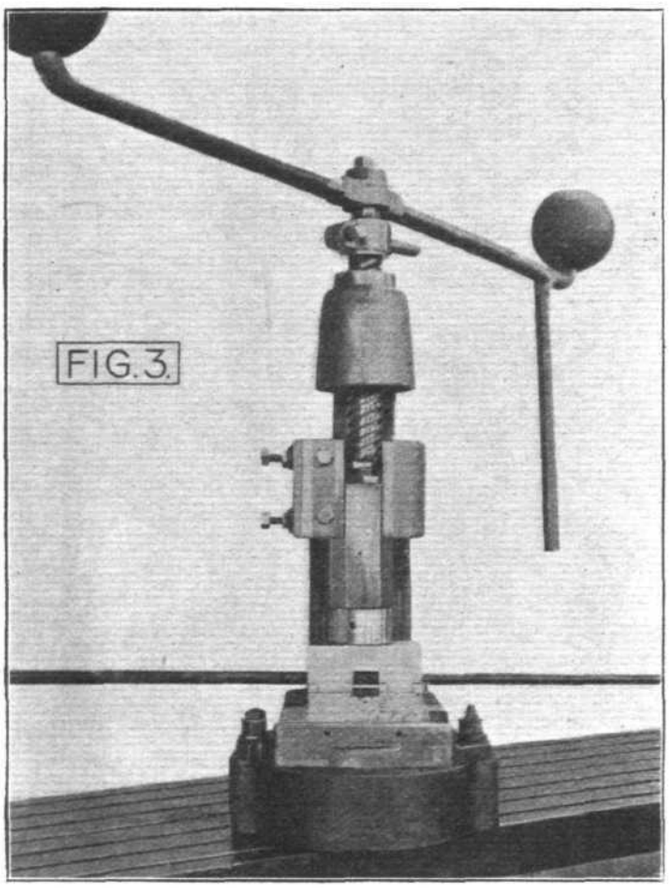
The mechanical operations in spar assembly using this combination of appliances are therefore :

(1) Depress plunger E.

(2) Rotate the lever D, and after slight movement of the bar C, leave go E, and after the bar has travelled 2 in. the plunger will automatically register with the next hole in C.

(3) Give the press ram the requisite down and up movement.

If the inner vertical faces of the tools A and B are a little more than 6 in. apart, the above three operations may be repeated three times successively ; then if the pitch of the rivets is 1 in. as in this particular case, it will be necessary before the operations are continued to place the necessary rivets in the holes which are in that part of the spar lying between the two tools. This has to be done by hand, but with simple spring loaders the whole six on any particular lip may be fed in simultaneously. It will be noted in Fig. 2 that the upper rivets are put in upside down. In order to



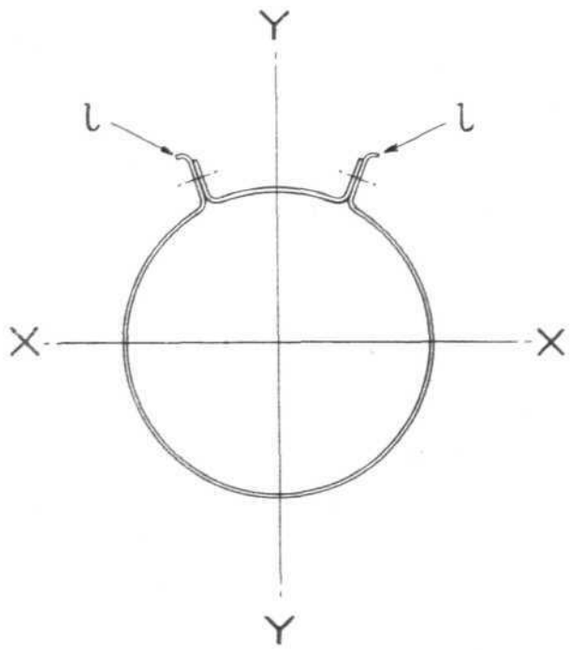


Fig. 4.

prevent them falling out, a thin layer of grease is spread on the underside of the two upper edges. The quickest results are obtained by two operators, one actuating the parts D, E, and the press handle and the other merely filling the loaders with rivets.

The above compound process could be extended so that more than eight holes could be punched simultaneously or eight rivets clinched if desired.

There are other advantages in this method of spar assembly. One is that manufacture in such a way does not call for specially skilled operatives, while a second advantage is that equal work is being done on each of the edges simultaneously, thus, there is no tendency for the spar to twist or bend. In earlier methods of assembly, where work was done on each rivet and edge separately, considerable skill was called for on the part of the operator in riveting up, rivets having to be put in and "snapped" with discrimination. Taking an extreme case as an illustration, it will readily be seen that if one of the four edges only is riveted up completely along its length, the stretching of the metal round each hole which accompanies the closing of the rivets will cause that edge to become curved, and thus throw the whole spar out of truth.

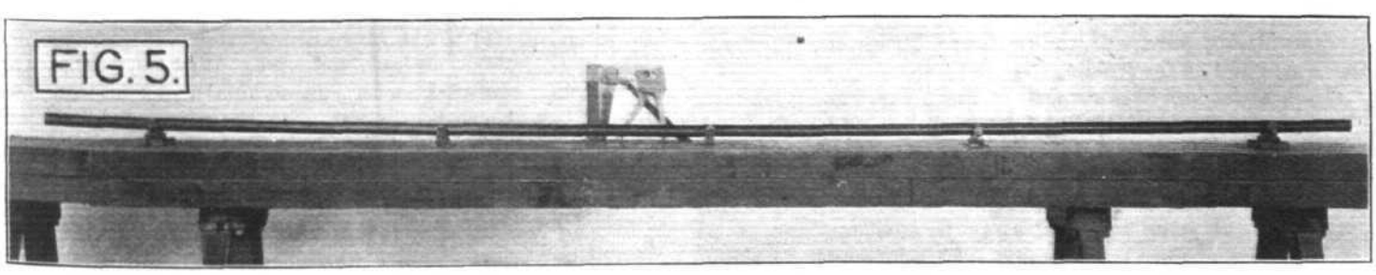
In the manufacture of strip fuselage bracing members, as illustrated in Fig. 9, page 16, Aircraft Engineer, a similar tool may be used under a gang press (*see* Fig. 3). The component tools are, of course, much simpler in this case because of the simpler form of the product required.

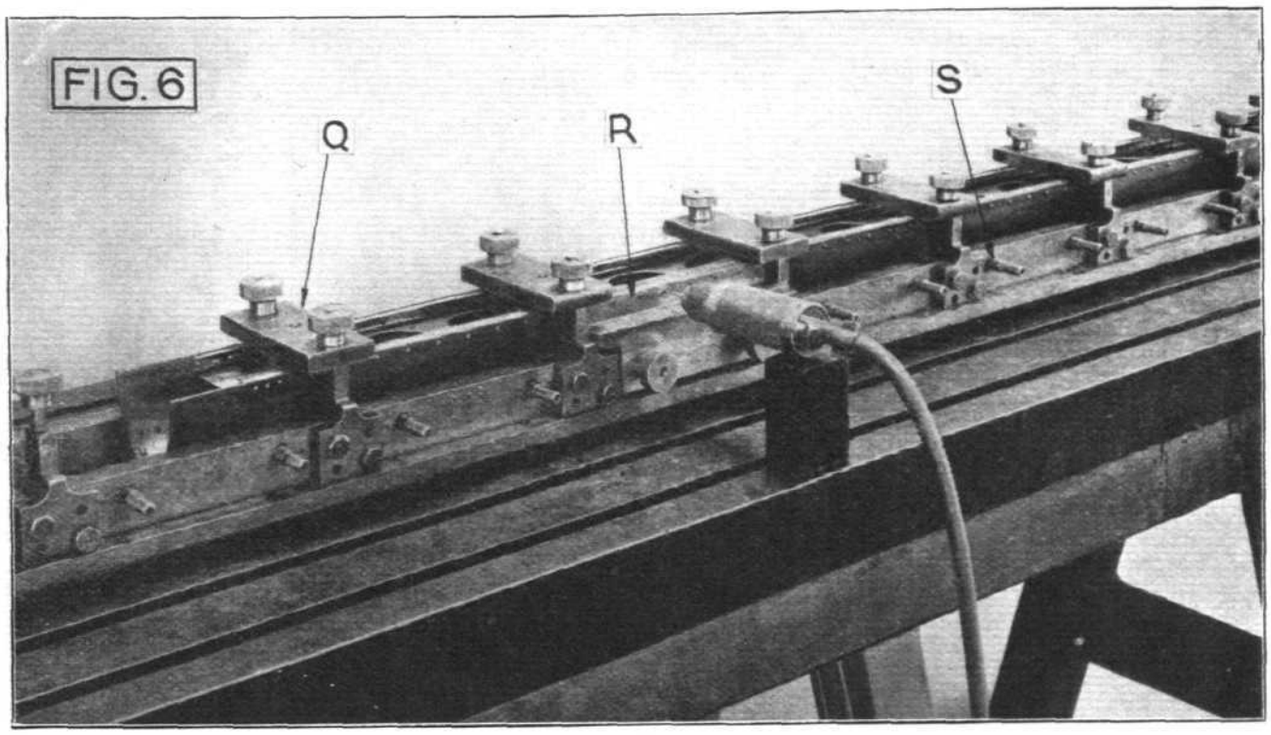
In some structural members there are not two axes of symmetry; in those cases the operations causing stretching of the edges cannot be carried out in such a way that one tendency to cause distortion cancels out with another. A case of this kind is illustrated by the fuselage longeron, Fig. 4.

A procedure which may be followed in such a case is to place the component sections in a jig so that the axes of all sections YY are vertical and the axes XX do not lie in one plane, but the points of intersection of the axes lie on a curve which is concave upwards. Then, when the rivets are placed in the lips *ll* the stretching effect is such that when the member is riveted up and removed from the jig the longitudinal axis is straight.

Such a procedure, it is admitted, is not consistent with the quickest production, and it has been found that with high-tensile steels and suitable choice of rivets and rivet spacing the distortion in assembly can be reduced to a small amount which can easily be corrected by bending back to the straight again. An idea of the amount of the initial set that may be required in some special cases may be gained from Fig. 5. The tools necessary for assembling these members are shown in Fig. 5, one for punching, the other for rivet-clinching.

The shape of some built-up members ensures that there shall be no deformation after riveting. Some interplane struts furnish an example of this. The load-carrying portion of such a member is shown in the jig, Fig. 6. By virtue of their depth these members have sufficient strength to resist the bending tendency of the riveting-up operation, and a straight assembly jig may be used. The illustration shows the details, and the method of using the jig needs little description. The flange and web are held in position by means of straps Q, and the hard bushes are carried in movable drill jig R. In this case the holes are drilled by means of an air-driven tool. There are advantages in using these air drills, the chief one being that the speed can be regulated easily over a wide range. In assembly, punching holes is nearly always preferable to drilling, but there are,





unfortunately, some cases where the positions of holes are not accessible for punching.

The horizontal studs S are used for holding the drilling jig R. This is moved into an adjoining position after the drilling of each set of eight holes.

It is not claimed that the above methods of assembly would be adequate for large-scale production, but such production would warrant the spending of a larger sum of money in tools than is indicated by the appliances described. The amount of money that may be spent in tools preparing for a job should bear some proportionate relation to the number of parts required; Fig. 6, for instance, merely shows a simple but effective jig suitable for the requirements of the moment.

(To be continued.)

DESIGN STRESSES

By CECIL D. HOLLAND, A.M.I.Ae.E.

(Concluded from p. 73)

The design stress may now be re-defined as follows:—

"The maximum stress the material will be subjected to when structure is loaded to an amount—the load factor times the normal load"—this maximum stress being 1·25 times the yield or proof stress of the material, with the following exceptions:—

(*a*) When the ultimate stress is less than 1·25 times the yield or proof stress.

(*b*) Struts and built-up sections where the stability of the section cannot be calculated, when the proof stress should be used.

Having enunciated a policy, what are the various design values required by the Design Office?

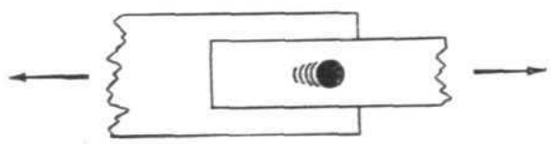
Tension.—The ultimate yield or proof stress can be ascertained by the standard test methods; and the design stress can then be determined.

Compression pure.—*E.g.*, very short struts and bending. Same remarks as for tension.

Compression for long struts.—As there is no known method of calculating the stability of a structural section, it is usual to use the yield or proof stress as the design stress. (As the number of materials that are likely to be used for long struts is small, a separate table could be prepared for these.)

Shear.—The same remarks apply to this as those given or tension and pure compression. It is interesting to note that in the case of steels, the design shear stress appears to have some direct relationship with the ultimate tensile stress. Thus at 20 tons ultimate the design shear stress is 75 per cent. of the ultimate, while at approximately 50 tons ultimate, the shear stress is 60 per cent. of the ultimate. A rough-and-ready rule is "The design shear stress is equal to half the ultimate tensile plus 5" (all in tons per sq. in.). This agrees well with known tests.

Bearing.—Unfortunately, "bearing" is not a stress of the fundamental order in the sense tensile, compression and shear are, and up to the present, no standard test has been instituted to determine this. The need for knowing such a stress occurs in the design of attachments made by bolting or riveting. Bearing stress can be best described as:—"The stress the material is subjected to by the bolt or pin trying to crush into it, which is measured by dividing the load by the projected area of the pin." An examination of a simple joint—*see* sketch below—will show that the stress under question is really a case of constrained compression.



The lateral strain is constrained by the material each side of the pin at right angles to the direction of load in the plane of the material, and if the bolt or rivet tightly grips the material, the strain at right angles to the plane of the material is also restricted to some extent.

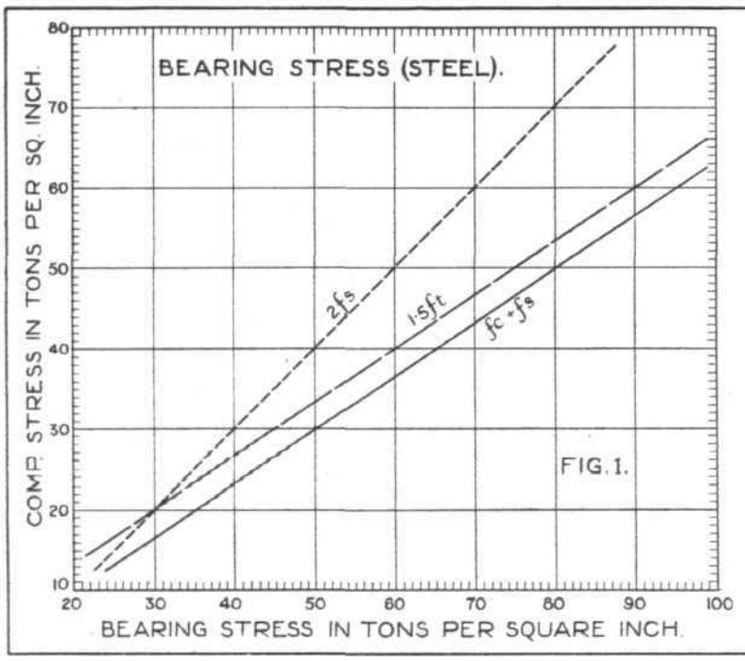
Values used in general engineering are usually derived from isolated experiments that are restricted in both range of materials and design. Empirical formulæ based on such tests are

$f_b = 1\frac{1}{2}\, ft.$ (ultimate) (Pippard and Pritchard).
$f_b = 2\, fs$ (Morley).

fail when applied to the range of materials and construction that exists in the aircraft industry. Without attempting to become confused with unsolvable mathematics, the material which crushes in line with the pin appears to fail by compression, and the shearing of the fibres in line with the outside edges of the pin.

The following empirical formula appears to cover the material and constructions within the limited experience of the author.

$f_b = f_c + f_s$ all design stresses.



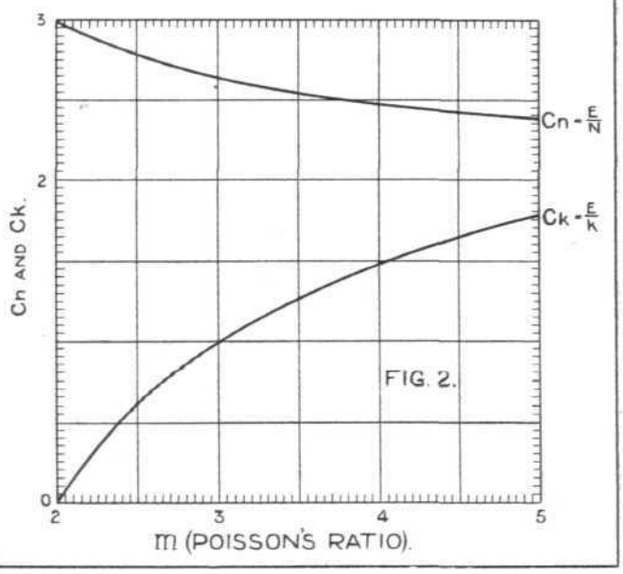


Fig. 1 shows this graphically for steels taking *fc* as equal to *ft*, and *fs* as equal to half *ft* plus 5 all in tons per sq. in.

Young's Modulus (E).—This can be determined by any of the standard test methods.

Modulus of Rigidity (N or G).—Ditto.

Poissons ratio.—This ratio is very seldom given and little used, but greater use could and should be made of it. *E.g.*, the mathematical relationship between the four elastic constants "E," "N," "K," and "*m*," are to be found in many text-books.

$$\text{Let } C_n = 2\left(1 + \frac{1}{m}\right) \text{ and } C_K = 3\left(1 - \frac{2}{m}\right)$$

$$\text{Then } \frac{E}{N} = C_n \text{ and } \frac{E}{K} = C_K.$$

Fig. 2 shows *Cn* and *Ck* plotted against "*m*." It will be noticed that "*m*" cannot be less than 2, or else "CK" has a negative value which is an impossibility. The use of the above curve has and would prevent the use of incongruous values for E and N. Moreover, Poissons' ratio is usually constant for any material, irrespective of its condition.

The Effect of Workshop processes on the Normal Design Stresses of the Materials.

If any material is likely to be used in a condition other than normal, *e.g.*, softened, annealed, etc., a definite set of values should be given for that particular state, along with the values for the normal state.

A process that is being greatly used (and its use is on the increase) is welding. In general, the effect of welding is to reduce the strength of the material, whilst the use of a subsequent heat treatment may replace part, if not all, the lost strength. Strength values should be given for normal-welded not heat treated, and welded heat treated. The second class needs qualifying in the case of long struts welded at the ends only, *e.g.*, long struts of constant section usually fail at the centre by bending, while the ends that are only subjected to pure compression are much over strength and could, therefore, be of weaker material. Thus, a long strut of constant section with welded ends and not heat treated would probably suffer no diminution of strength due to the welding.

The Effect on the Design Stress Value due to different Types of Loading

All the design stresses given are for a normally steady load. It is well known that materials fail at a much lower stress when they are subjected to a rapidly varying load.

All structural members of an aircraft have fluctuating loads, but fortunately the frequency is so low, and does not affect the strength, with the one possible exception: the engine structure. Here, the frequency of vibration is a function of the engine revolutions. The members themselves do not appear to be affected except in the case of engines having a very uneven torque. The parts that appear to suffer are the end attachments by shear and bearing. A good empirical rule for dealing with fluctuating loads has been suggested by Dr. Arnold, *i.e.*, the equivalent constant load is equal to the range of load plus the maximum load.

Conclusion.—The three main advantages which would accrue if a clear-cut design stress policy, as outlined above, were agreed upon.

(1) Consistent design stresses by all the aircraft constructors.

(2) True design figures of merit could be obtained by using the formula given by A. J. Sutton-Pippard in R. & M. 729 in conjunction with the design stresses instead of the proof stresses.

(3) Manufacturers of raw materials wishing to introduce a new material to the aircraft industry would know exactly what information is required by the aircraft designer.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C. 2; 28, Abingdon Street, London, S.W.1; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; or 120, George Street, Edinburgh; or through any bookseller.

REPORT ON THE DEVELOPMENT OF A HOT-WIRE RATE OF DESCENT METER. By G. W. H. Gardner, B.Sc., and F. W. Meredith, B.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1144 (Ae. 312). (16 pages and 10 diagrams).) August, 1927. Price 1*s.* net.

The general purpose of the investigation was to provide an instrument for aerodynamic research which will indicate varying rates of descent of an aeroplane.

An instrument involving the principle of the hot-wire anemometer has been developed and tested in flight and its characteristics have been treated theoretically.

The instrument developed will indicate the rate of descent of an aeroplane within a range of 0-60 ft. per second with an accuracy of ± 1 ft. per second and has an indication time-lag to 1/e of its amplitude of less than one second. The instrument is bulky and is not recommended for other purposes than aerodynamic research.

At the request of the Aeronautical Research Committee a rate of descent recorder involving the principle of the existing hot-wire rate of descent indicator is now being designed.

THE AIRCRAFT ENGINEER

THE BEHAVIOUR OF A SINGLE CRYSTAL OF α-IRON SUBJECTED TO ALTERNATING TORSIONAL STRESSES. By H. J. Gough, M.B.E., D.Sc., Ph.D. Work performed for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1148 (M. 54). October, 1927. (34 pages 40 photographs, 15 diagrams.) Price 2*s.* 3*d.* net.

A general research is in hand at the National Physical Laboratory on the properties of the fatigue of materials and the present experiments, which are a part of this research, relate to a series of tests on large metallic single crystals. In previous experiments single crystals of aluminium * were used and it is believed that the present fatigue tests on a single crystal of α-iron are the first of their kind. The changes in microstructure of α-iron and the method of failure produced by alternating torsional couples have been studied in relation to the crystal structure and to the stress system employed and the results of the experiments are consistent with a new theory of the mechanism of distortion, which is here outlined.

Slip is determined by shear stress considerations and the direction of slip coincides with that of the most highly stressed principal line of atoms (greatest linear atomic density). Deformation of the specimen under test usually occurs by slip on two of the crystallographic planes.

Further experiments are contemplated to repeat the present experiments on a crystal possessing a different relative orientation of the crystallographic and straining axes. Other experiments will be directed to repeated straining actions and to the study of single crystals of iron under repeated impact stresses, thus continuing earlier work.†

* "Experiments on the behaviour of single crystals of aluminium."—Gough, Wright and Hanson. Jour. Inst. Metals, vol. xxxvi, No. 2, 1926, p. 187.

† "The Resistance of Materials to Impact."—Stanton and Bairstow. Proc. Inst. Mech. Engrs., Nov. 1908.

REPORTS AND MEMORANDA OF THE AERONAUTICAL RESEARCH COMMITTEE PUBLISHED BETWEEN MARCH 1ST, 1927, AND JUNE 30TH, 1928. R. & M. No. 1150. July, 1928. (8 pages.) Price 4*d.* net.

The Aeronautical Research Committee issue at intervals lists of Reports and Memoranda published between given dates. The complete lists are given in R. & M. Nos. 650, 750, 850, 950, 1050, and the present issue, which last covers the period up to June 30, 1928. For a classified list under subjects of the reports on sale by His Majesty's Stationery Office, application should be made to that office for their free issue, known as "List B" (revised to February 21, 1928).

EXPERIMENTS WITH THE FAMILY OF AIRSCREWS IN FREE AIR AT ZERO ADVANCE, By H. C. H. Townend, B.Sc., W. S. Walker and J. H. Warsap. R. & M. No. 1153. (Ae. 318). April, 1928. (10 pages and 6 diagrams). Price 1*s.* net.

It has always been somewhat uncertain how nearly the performance of an airscrew rotating at a fixed point in free air can be estimated from the usual "static" tests in which the screw is tested in a wind tunnel with the tunnel fan at rest. The screw itself induces a general flow along the tunnel which may be quite appreciable so that the condition of zero advance is not actually obtainable. In order to overcome this difficulty and so obtain more reliable results with which to compare the theory in this region, the tests described in this report were made, under conditions closely approximating those of free air. As no measurements of velocity had been made in the original static test of the Family* it was decided to repeat them in the tunnel and to observe the tunnel velocity by means of a sensitive vane anemometer, as well as on the tunnel gauge.

It was found not to be possible to estimate accurately the thrust at static from tests in a tunnel made with the wind off unless the velocity induced by the screw is measured with a sensitive anemometer, in which case a reliable value of V/nD can be found which corresponds to the measured thrust. For a 3 ft. screw tested in a 7 ft. tunnel this value may also be derived empirically from a curve (Fig. 6) in terms of the P/D ratio of the screw. By either method the resulting value of V/nD will be sufficiently near zero to permit of extrapolation to zero, except for screws of high pitch, which are usually critical near static.

* R & M. 829. Experiments with a family of airscrews, including the effect of tractor and pusher bodies. Part I—Experiments with the family of airscrews mounted in front of a small body.—By A. Fage, A.R.C.Sc. C. N. H. Lock, M.A., R. G. Howard, B.Sc. and H. Bateman, B.Sc.

ON THE HORIZONTAL FLIGHT OF A HELICOPTER. By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1157. (Ae. 322). (12 pages and 2 diagrams). March, 1928. Price 9*d.* net.

In a previous report (R. & M. 1132)*, a theory has been developed for the vertical ascent of a helicopter, and this has now been extended to cover the case of horizontal flight also.

The analysis is confined to the case when the helicopter is in horizontal flight with its axis vertical. The effect of variation of the blade angle is considered, and also the effect of the periodic motion on the behaviour of airscrews mounted on the blades.

The effect of the horizontal motion of the helicopter is to reduce the power required for sustentation. The drag force is not high and the helicopter should therefore be able to attain a satisfactory horizontal speed.

*R. & M. 1132. "On the vertical ascent of a helicopter," H. Glauert.

THE RESISTANCE OF THE INTERNATIONAL AIRSHIP MODELS MEASURED IN THE WIND TUNNEL OF THE ROYAL COLLEGE OF SCIENCE, SOUTH KENSINGTON, S.W.7. By Professor F. T. Hill and T. Tanner, A.C.G.I., D.I.C. Communicated by Professor L. Bairstow. R. & M. No. 1160. (Ae. 325). (9 pages and 9 diagrams). March, 1928. Price 9*d.* net.

The two models here described were tested over a range of wind speeds up to 75 ft. per second to find the resistance at different Reynolds numbers. The report contains a careful description of the method of test and discusses the effect of various supports for the model.

The resistance coefficient of the short model decreased with increase of the Reynolds number over most of the experimental range, and the coefficient of the long model increased slightly.

REPORT ON THE DROP OF STRESS AT YIELD IN ARMCO IRON. By A. Robertson, D.Sc., and A. J. Newport, B.Sc. Work performed for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1161. (M.56.) (7 pages and 25 diagrams.) November, 1927. Price 9*d.* net.

One of the authors had previously investigated the drop of stress at yield in ductile material in compression and in conjunction with Professor G. Cook in tension alone. The apparatus used in these investigations did not permit of tension and compression tests being carried out on the same specimen. It appeared desirable to investigate the phenomenon further and apparatus was constructed with the help of a grant from the Engineering Board to test hot rolled Armco iron.

It was observed in the preliminary tests on this material that the yield stress was affected by the rate at which the straining was made. In order to obtain consistent results it was found necessary to adopt a low rate of straining. When the time from zero load to yield load was about half-an-hour, quite consistent results were obtained.

Small scale tension and compression stress-strain diagrams for "as received" material are shown in Figs. 4 and 5 and large-scale diagrams in Figs. 6 and 7. Tension and compression diagrams for normalised material are shown in Figs. 8, 9 and 10.

The tension and compression diagrams were found to be of slightly different types. In tension, immediately after the drop of stress at yield, there is no increase in stress until the strain is about twelve times the yield strain. In compression, however, this region of constant stress is absent, the stress rising immediately after the drop of stress at yield has taken place. The exact shape of the stress-strain diagram immediately after yield can also be varied slightly by the manner in which the test is carried out.

With this material the yield does not take place so suddenly as with an ordinary mild steel. For "as received" material the yield stress was 9·35 tons/sq. in. in tension and 9·61 tons/sq. in. in compression, and for normalised material 8·63 tons/sq. in. and 10·0 tons/sq. in. respectively.

The drop of stress at yield for "as received" material was 20 per cent. in tension and 24 per cent. in compression, and for normalised material 15 per cent. in tension and 23 per cent. in compression. The "drop" stress, or stress immediately after yield, for the "as received" material was 7·5 tons/sq. in. in tension and 7·3 tons/sq. in. in compression. For the normalised material it was 7·3 tons/sq. in. in tension and 7·7 tons/sq. in. in compression.

A SUMMARY OF THE EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF THE CHARACTERISTICS OF AN AUTOGYRO. By H. Glauert, M.A., and C. N. H. Lock, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1162 (Ae. 326.) April, 1928 (5 pages.) Price 4*d.* net.

Several reports on the autogyro have been published by the Aeronautical Research Committee, and a list is given below. The present paper was written at the request of the Committee to summarise the results of the experimental and theoretical investigations on the autogyro's characteristics.

The experimental and theoretical results of the paper are in satisfactory agreement on all essential points, it would appear that the performance of a gyroplane is inferior to that of a corresponding aeroplane, but the gyroplane possesses valuable qualities of stability at large angles of incidence and of ease of landing.

LIST OF REPORTS

Ref. No.	Report.	Author.	Title.
1	R. & M. 1111	H. Glauert	A general theory of the autogyro.
2	R. & M. 1116	L. E. Caygill and A. E. W. Nutt	Wind tunnel and dropping tests of autogyro models.
3	R. & M. 1111	H. Glauert	An analysis of the energy losses of an autogyro.
4	R. & M. 1127	C. N. H. Lock	Further development of autogyro theory.
5	R. & M. 1154	C. N. H. Lock and H. C. H. Townend.	Wind tunnel experiments on a 6-foot model autogyro.
6	R. & M. 1108	H. E. Wimperis	The rotating wing in aircraft.

NOTE ON THE FORCES EXPERIENCED BY ELLIPSOIDAL BODIES PLACED UNSYMMETRICALLY IN A CONVERGING OR DIVERGING STREAM.—By Dr. H. Lamb, F.R.S. R. & M. No. 1164 (Ae. 328). May, 1928. (4 pages and 3 diagrams.) Price 4*d.* net.

The forces on ellipsoidal bodies placed obliquely in a converging or diverging stream can be found direct by calculation of the pressures on the surfaces. This has been done in the present report for the two-dimensional flow past an elliptic cylinder and for an ellipsoid of revolution. The results agree with those of the indirect but more general investigation by G. I. Taylor.*

* The force acting on a body placed in a curved and converging stream of fluid.—G. I. Taylor. (R. & M. 1166.)

TO CONTRIBUTORS.

The Editor will always be pleased to consider for publication articles on any subject relating to aircraft engineering, and particularly articles dealing with design and constructional problems in seaplanes and flying-boats. Articles published will be paid for at our usual rates.

FLIGHT

PRIVATE  FLYING

A Section of FLIGHT in the Interests of the Private Owner, Owner-Pilot, and Club Member

NEW AERODROME

Heston, Middlesex

We have enlightened our readers in recent issues concerning the new aerodrome now being constructed at Heston, Middlesex. To be more geographically exact the village of Cranford is the venue rather than Heston, the distance between the villages being about 1½ miles. The office of Airwork, Ltd., the company responsible, is in Cranford and the field practically adjoins it. The site comes almost on the ten-mile radius of London, and although for pedestrians it involves a considerable walk from the nearest public conveyances at the present time it cannot by any means be called inaccessible, whilst there is every possibility in the future of a hundred-feet road running through to the heart of London, absolutely cutting the edge of the flying field.

["Flight" *Photo*

Mr. N. St. V. Norman, private owner of a D.H. "Moth" (Cirrus) fitted with Handley Page slots. He is co-director with Mr. F. A. I. Muntz, of Airwork, Ltd., who are constructing the Heston Aerodrome, Middlesex.

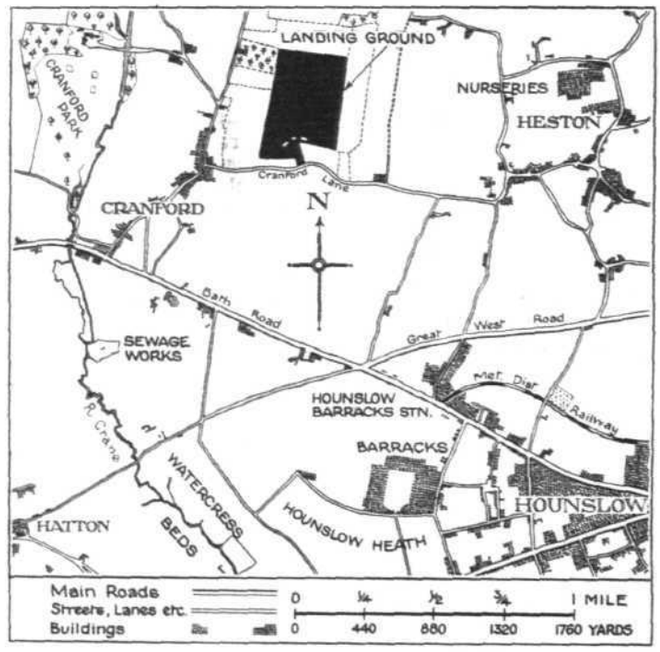
A large field separates the aerodrome from the Great West Road and approach by car is quite convenient. The site can be seen from that road. The close district of Hounslow has been considered as the victim of too much fog for flying and this was understood to be one of the reasons against the development of the civil air port there, from which the first air lines to the Continent operated. But one understands that an investigation into statistics from authentic sources do not confirm that meteorological condition as being more partial to the district than elsewhere.

The prevailing wind is south-west, so that the artificial clouds which belch forth from London and constantly lower the degree of light are not blown over Heston. This prevailing wind is also favourable for the best landings because it is on the eastern side that no obstructions lay whatever, and a machine heading down into a westerly or south-westerly wind can come in so flat as to be practically down when on the very border of the field. The immediate surroundings generally are flat fields, which add considerably to the advantages of the site. Then such will be the designed placing of the hangars, etc., that, as a rule, a machine will be able to land towards them, and continue straight on when taking-off again, instead of taxi-ing all the way back for a suitable run.

Fields surround the site on the east, south and north, and the village of Cranford is on the south-west and west, but even then there is an intervening field, allowing time for safe clearance over the village. To the north and below the Grand Junction Canal there is a large area of land which would make an admirable site for any commercial development that may follow in the wake of an expanding aerodrome. It is hoped that it will be utilised in that way! It would not restrict the flying field because there would still be intervening land, which will be added to the present field as occasion demands.

Wide Outlook

It is the far-sighted policy of the directors of Airwork, Ltd., in making certain, at great expense, of scope for development that makes their programme so authentic. There is much talk today about schemes for aerodromes without corresponding practical results. One can see from the experience of the directors of Airwork, Ltd. that some who propose schemes should be active followers of aviation who find a need for aerodromes. There would be wider progress. The Heston scheme originated from a direct need of the directors, Mr. N. St. V. Norman and Mr. F. A. I. Muntz in their capacity of private owners. They required a field convenient to London for their private use. And this led



HESTON AERODROME, MIDDLESEX: This new aerodrome is about 600 yards by 450 yards, and is suitable for enlargement to 800 by 800 yards as necessity demands. It is on the 10-mile radius from London, and will be ready by next April.

to the realisation that there were many private owners faced with similar necessity. Of course, they hope as their scheme expands to attract commercial aircraft as well as private aircraft, and in fact embrace general aviation with its many forms.

But all these attractive developments belong to the future as the directors are anxious to point out. What is of main importance to private flying now is that at Heston today a most suitable field has been definitely purchased and work is proceeding daily to change it to conform to the needs of a flying field. Two hangars and a club house will be erected as a commencement. The size of the chosen site is now 600 by 450 yards. It is practically hedgeless and the surrounding areas will later be added, making then a site of approximately 800 by 800 yards. Entrance will be from Cranford Lane (seen on the map) which leads briefly to Cranford and, at length, to Heston. The soil is a London brick earth and considered particularly good for the purpose. One exceptionally good aspect of the site is its flatness.

There is only one mound there now, really negligible, but for all that it is being levelled. Another small one has already disappeared. Mr. N. St. V. Norman has already made landings there. Recently he toured Europe partly to collect data on aerodromes. Incidentally, he found Poland excellent flat country for flying, for it offers splendid landing grounds. He flies a D.H. "Moth" (Cirrus) fitted with the Handley. Page slots. In 1926 he owned and flew an Avro 548 G-EPBJ. He is the son of Sir Henry Norman, formerly M.P. for Blackburn, and a member of No. 601 Squadron (Auxiliary Air Force). Heston Aerodrome is likely to be ready next April.

FUTURE OF THE FLYING CLUBS

THE future of the flying clubs in this country has always been a subject to provoke speculation, and as we draw nearer to that time when, according to the understood policy of the Air Ministry, the subsidy will cease, speculation is intensified. It is common knowledge amongst followers of the club movement that a scheme is being broached which may vitally affect their future. It is a gigantic scheme, as rumour has it, which will embrace not only the clubs but practically every aspect of 'flying in this country.

We have been given a vision of hundreds of aerodromes, for instance, dotting the land, and also a large number of flying schools. Joy-riding, taxi-flying, maintenance and supply of machines and feeding great air routes, are but a few of the other tasks that this mammoth organisation proposes to gather under its wing. Associated with it as an originator, or as one of the originators, is, it is understood, a well-known figure, one who has held the highest position in aviation at one time during his career, and who, it may well be, will be favoured with partial support of the Government for a substantial period, say, ten years. In effect, it is easy to visualise this fundamental movement, if it matures, as a sort of Home Imperial Airways.

Now, how will the future of the flying clubs be thereby affected? Frankly, it suggests, according to the present information of which one may make use, that they may lose some of their individuality. Actually their position has been defined as "associated." It looks as though, being dependent upon the official subsidy which comes to an end in about two years' time, they will be bound in the cause of self-preservation to fall into line, particularly if the scheme has the support of Government. Because it would mean that the Government would not support both this gigantic organisation and, separately, the clubs. It seems at the moment as if the scheme will be the only alternative for the clubs when their subsidy finishes, unless they have affluent supporters willing to see that they maintain their individuality.

At the last meeting of the General Council of Associated Light Aeroplane Clubs, this all-important subject was discussed. The position of the clubs was defined, as stated above, as "associated," and it was explained that they would be able to purchase new machines to better advantage, obtain repairs cheaper, and have the use of the new aerodromes, etc.

In the October issue of that witty club organ, "The Elevator," published by the Lancashire Aero Club, the Editorial discusses the question from the club point of view. It throws a light upon what most other clubs may be thinking. We quote a few passages. . . . "The one apparent disadvantage of the scheme would appear to be that if an existing club preferred to retain its own individuality, and not amalgamate with the new company, it would automatically, as far as one can see, be squeezed out of existence, unless it happened to possess exceptionally wealthy members. The subsidy expires in less than two years' time, as far as we are concerned, and it is quite clear that if this new company is formed with governmental blessing in the meantime, any fresh subsidies will be diverted from the old clubs to the new company. . . . It will be no use complaining because a commercial company formed for the purpose of making profits has been preferred to those who have, as it were, borne the heat and burden of the day without seeking reward. If any complaining is to be done it should be done now, but before making any complaint we should be first satisfied that we have just grounds for it. . . . Looking at it from every point of view, this is at least open to doubt. The duty of the Government is to spend the public money to the best advantage of the country as a whole."

The Editorial quoted also suggests two conditions that should be weighed. The first is that "any club in existence shall have the right to become associated with the new company within a fixed time limit upon terms which will reserve to the club full control of its private affairs." Also that "in respect of any subsidy to be paid to the new company for the training of pilots or the maintenance in training of existing pilots, the clubs associated shall, as regards any such training and maintenance done by them, be entitled to participate in the subsidy and to have the same paid to them in like manner as if such training and maintenance had actually been carried out by the new company itself."

At present that is as far as we can go—developments in the near future may well be looked forward to with considerable interest.

The Atlantic Flight

WE regret to state that Lieut.-Commander H. C. MacDonald, D.S.C., who left St. John's, Newfoundland, on October 17 for England on his own Gipsy-Moth, has not since been heard of. He started at 5 p.m. (G.M.T.) solo, with sufficient petrol to last 25 hours. To the Irish coast the distance over the Atlantic is about 2,000 miles. No wireless was carried. The Dutch steamer *Hardenberg* reported sighting the machine 600 miles off Newfoundland 5½ hours after the start. The attempt was a purely private venture.

Manchester's Aerodrome

A SITE for its municipal aerodrome has been selected by Manchester, and was inspected by Sir Sefton Brancker, on October 19. The site is part of Barton Moss and owned already by the Corporation. It is seven miles from the city's centre and requires no great alteration for the objective. In extent it is 100 acres. Sir Sefton Brancker flew to Manchester from Stag Lane. He approved of the site, and reported it as approachable, non-smoky, had excellent landmarks and a good surface. The Manchester Ship Canal is close to the ground.

Flying Club Accidents

Two similar air accidents occurred over the week-end at golf courses. Miss S. O'Brien, private owner-pilot, crashed at Mill Hill on October 20 in her D.H. "Moth," and unfortunately her leg had to be amputated below the knee. Her passenger, the Hon. M. K. Leith, suffered from concussion. Both are progressing as well as can be expected. The other accident was to Mr. R. E. H. Caldecott, a member of the Lancashire Aero Club, and his passenger, Mr. W. J. Ramsden. They spun into the ground at Cheadle Hume, Cheshire, and both suffered from head injuries, and the latter also had a fractured leg. They are also progressing as well as can be expected. Further references to these mishaps are made in the Light 'Plane Club Notes in this issue.

Canadian Flying Clubs

THE Toronto and Montreal Flying Clubs lead all Canada in flying hours, according to a report of the Department of National Defence. Up to the end of September, Toronto 'planes registered 881 flying hours, Montreal 590, Ottawa 480, Hamilton 408, Regina 303, Edmonton 266, London 159, Victoria 77, Border Cities 50 and Calgary 37.

FLIGHT

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware. Sec., H. E. Perrin, 3, Clifford Street, London, W.1.

Bristol and Wessex Aeroplane Club, Filton, Gloucester. Secretary, Major G. S. Cooper, Filton Aerodrome, Patchway.

Cinque Ports Flying Club, Lympne, Hythe. Hon. Secretary, R. Dallas Brett, 114, High Street, Hythe, Kent.

Hampshire Aero Club, Hamble, Southampton. Secretary, H. J. Harrington, Hamble, Southampton.

Lancashire Aero Club, Wodford, Lancs. Secretary, F. W. Atherton, Woodford Aerodrome, Cheshire.

Liverpool and District Aero Club, Hooton, Cheshire. Hon. Secretary, Capt. Ellis, Hooton Aerodrome.

Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Major Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.

Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, J. T. Dodds, Cramlington Aerodrome, Northumberland.

Norfolk and Norwich Aero Club, Mousehold, Norwich. Secretary, G. McEwen, The Aerodrome, Mousehold, Norwich.

Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., Imperial Buildings, Victoria St., Nottingham.

The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, Harry W. Smith.

Southern Aero Club, Shoreham, Sussex. Secretary, C. A. Boucher, Shoreham Aerodrome, Sussex.

Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.

Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

LONDON AEROPLANE CLUB

REPORT for week ending October 21.—Pilot instructors: V. H. Baker and F. R. Matthews. Ground Engineer: C. Humphreys. Aircraft: The following machines were in commission during the week: G-EBNY—G-EBMP—G-AABL—G-EBXS. Total flying time for the week, 38 hrs. 15 mins.

Dual instruction: 15 members were given dual instruction and the flying time was 15 hrs. 55 mins.

Solo flying: 19 members with "A" licences made solo flights and the flying time was 19 hrs. 45 mins.

Eight passenger flights were given to temporary members and the flying time was 2 hrs. 35 mins.

Accident to Miss S. O'Brien.—All members will be deeply sorry at the sad accident to Miss O'Brien and the Hon. Miss M. K. Leith, both members of the club, on Saturday last. Miss O'Brien was one of the earliest of our lady members to take up flying as a profession. She purchased a D.H. "Moth" and eventually qualified for a "B" licence. She was presumably giving flying instruction on her own machine at the time of the accident.

All members will join in wishing both these ladies a speedy recovery. The operation which had to be performed on Miss O'Brien will probably prevent her from taking an active part in the profession to which she was so much attached. Her enthusiasm for flying was unbounded and she will, we are sure, receive the sympathy of all.

BRISTOL & WESSEX AEROPLANE CLUB, LTD.

REPORT for week ending Saturday, October 20.—Pilot instructor for the week, E. W. B. Bartlett. Ground engineer, A. W. Webb. Machines in commission, GEB-YH and GEB-TV. Flying time for week, 6 hrs. 30 mins. Pupils under instruction and hours flown, 4 pupils (1 hr. 35 mins.). Soloists and hours flown, 2 pupils (20 mins.). "Pilots" and hours flown, 3, for 1 hr. 20 mins. Passengers carried and hours flown, 8 passengers for 2 hrs. 25 mins. Test flights and hours flown, six flights of 35 mins.

Bad weather has made flying quite impossible most of the week. After five rather miserable days we had great fortune in enjoying an almost perfect day for our "At Home" on Saturday. Most of the visitors we expected arrived. First of all we were very glad indeed to welcome Sir Sefton Brancker who flew down in GED-CA. Captain Broad came in GEB-YK and gave us two very finished exhibitions of aerobatics which delighted everyone, and which were loudly applauded on their conclusion. We were especially pleased to welcome representatives from the Midland and Nottingham Clubs, and tender our thanks to Flight-Lieut. Rose and Mr. Ball for assisting to make the afternoon the great success it was. Mr. Tapper brought the A.A. "Moth" G-EBUR, Mr. Penrose Westland "Widgeon" G-EBRO, and Mr. Parkhouse his "Avian" G-EBXO, and we hope they enjoyed the day as much as we appreciated seeing them. Mr. Bartlett gave us two typical flights, such as we have learnt to enjoy. These were immensely appreciated by a large gathering of members and their friends. The competition was won by Flight-Lieut. Rose with Miss Parker as passenger. A silver cigarette case and silver clock were the prizes and these were presented by Mrs. Ashley Hall. We would like to thank the Automobile Association for their control of all arrangements during the day, and their organisation before and during the afternoon, all of which were of invaluable assistance to us and pilots visiting. The afternoon was intended more as a friendly social gathering of an informal nature, rather than a flying meeting and as such we think the day was a great success. There was a dinner at the Grand Hotel, Bristol, in the evening, which was attended by 35 visitors and members. Sir Sefton Brancker, in an amusing speech, included the outlines of the forthcoming Light Aeroplane Club.

HAMPSHIRE AEROPLANE CLUB

REPORT for week ending October 20.—Pilot Instructors, Flight-Lieut. F. A. Swoffer, M.B.E., and Mr. W. H. Dudley. Ground engineers, Mr. E. Lenny and Mr. J. Elliott. Aircraft, D.H. 60 "Moths," G-EBOI and G-EBOH. Flying time for the week, 22 hrs. 25 mins. Pupils under instruction (19), 12 hrs. Soloists (3), 3 hrs. 55 mins. "A" pilots (8), 5 hrs. 35 mins. Passengers (2), 40 mins. Tests (6), 55 mins.

Messrs. R. M. Wilson, A. L. Angus and M. M. Roy have joined us this week as pilot members.

Miss Home and Mr. Coode have successfully passed their figures of eight tests.

Bad weather this week has considerably curtailed our flying time. On Thursday it was impossible for the machines to leave the hangar owing to a violent gale.

We notice from last week's notes that our good friends of the Suffolk Club are under the impression that we have only one machine. Occasionally owing to mishaps, from which no club is free, our usual number of machines (three) has been reduced to one. This week we have had two "Moths" in commission and we expect to have the "Avian" back very soon now. Our membership is at present 410 and if this is 409 more than that of the Suffolk Club we extend our sympathy. We trust that their one member is now approaching "A" licence stage. In spite of our large membership if this gentleman should ever desire to make a change we can promise to give him all the flying he can wish for.

LANCASHIRE AERO CLUB

REPORT for week ending October 20.—Flying time, 25 hrs. 15 mins. Instruction, 7 hrs. Solo flights, 7 hrs. 20 mins. Passenger (22), 8 hrs. 35 mins. Tests (17), 2 hrs. 20 mins.

Four machines in commission:—G-EBXD, G-EBMQ, G-EBNF, G-ENQL.

Instruction (with Mr. Hall (14):—Cohen, Foote, Hardy, Goss, Whitehouse, Gort, Roberts, Miss Baerlein, Kay, Allot, Miss Swithenbanks, Faulkner, Weale, Ginger.

Soloists (under instruction):—Kay (H. T.), Faulkner. Hours flown, 1 hr. 30 mins.

Pilots:—Cohen, Michelson, Hardy, Lacayo, Ruddy, Goodfellow, Mills, Gort, Meads, Nelson, D. Harrison. Hours flown, 5 hrs. 50 mins.

Passengers:—(With Mr. Cantrill): Miss McCleary; (with Mr. Hall, R. F.): Harrison, Elwell, Miss Kinder; (with Mr. Caldecott): Miss Swithenbanks, Ruddy, Scholes, K. A. Caldecott, N. H. Maharn, Miss Richmond, Miss Niness Dines; (with Mr. Nelson): D. Stern; (with Mr. Lacavo): Benson, A., Miss Butler, Marshall; (with Mr. Scholes): Hurst Shackleton, Gregory, Dyson; (with Mr. Twenlow): Allott.

New pupil.—Mr. T. E. V. Roberts.

"A" Licence.—Mr. J. C. Weale.

Mr. T. E. V. Roberts commenced instruction with the club this week. Mr. J. C. Weale obtained his "A" Licence, and Mr. Faulkner carried out a successful height test.

A serious accident occurred to the Avro-Gosport G-EBNF on Sunday afternoon. The pilot, Mr. R. E. H. Caldecott and his passenger, Mr. Ramsden were both injured, the latter seriously. This is the first occasion since the club commenced flying nearly five years ago upon which either the pilot or passenger in a club machine has sustained injuries.

LIVERPOOL & DISTRICT AERO CLUB

REPORT for week ending October 20.—Instructor, Flt.-Lieut. J. B. Allen. Ground Engineer, Mr. Howard Pixton. Machines in commission, G-EBXX, G-EBWK.

Total flying time for week, 12 hrs. 25 mins. Pupils under instruction with Capt. Allen flew a total of 10 hrs. 35 mins. Soloists (under instruction) flew a total of 25 mins. Passenger flights total 10 mins. Test flights total 40 mins.

Messrs. Aerofilms used one of our machines for 35 mins. on aerial photography work (pilot, Mr. Allen).

Bad weather has seriously curtailed our flying time this week.

On Sunday last, XX, piloted by Mr. Allen, with Mr. Barker under instruction, tried conclusions with a sheep when landing. The undercarriage promptly folded back, and XX took a rest until Thursday. As for the cause, "A Sheep from Hooton—bang! zip!!! . . . Mouton!

MIDLAND AERO CLUB

REPORT for week ending October 20.—The total flying time, 20 hrs. 33 mins. Dual, 7 hrs. 50 mins. Solo, 7 hrs. 35 mins. Passenger, 4 hrs. 30 mins. Test 38 mins.

The following members were given dual instruction by Flt.-Lieut. Rose, D.F.C., and Mr. W. H. Sutcliffe:—M. C. Wilks, R. G. Welch, G. Potter, F. D. Scott, T. W. Wild, J. Williamson, W. L. Handley, H. Beamish, Dr. W. G. Tilleke, Mrs. Leigh-Fermor.

"A" Pilots.—H. J. Lattey, S. G. Hall, E. R. King, W. M. Morris, S. H. Smith, G. Robson, M. A. Murtagh, G. C. Jones, R. L. Jackson, R. C. Baxter, J. Cobbe, J. Rowley, R. D. Bednell, W. Swann.

Soloists.—M. C. Wilks, R. G. Welch, J. Williamson, J. K. Morton, H. E. Evans, W. L. Handley.

Passengers.—S. G. Hall, S. Buckle, S. H. Smith, A. Hill, Miss J. Warden.

Mr. W. L. Handley, of T.T. fame, was launched solo during the week.

NORFOLK & NORWICH AERO CLUB

REPORT for week ending October 21.—Total flying time, 1 hr. 20 mins. Soloists, Messrs. A. G. Marshall, W. S. Coates.

Only two people have braved the elements this week, chiefly owing to there being only one machine, and that was not available until Saturday, when, after that, the winds were so strong that flying was not quite so pleasant as to induce members to leave their comfortable fires. Fireside aviators are, we suppose, to be found in every club. We were visited this week by the Marquis of Clydesdale, who, it will be remembered, carved a name for himself in the boxing world. The weather when he arrived in his Moth was distinctly filthy, and apart from boxing, he can call himself a pilot also. His landing was everything to be desired on such a day. After lunch at the club with friends, he left on his return journey in a bit better weather.

SUFFOLK & EASTERN COUNTIES AEROPLANE CLUB

REPORT for week ending October 20.—

Instructor: G. E. Lowdell, A.F.M. Ground Engineers: "C"—E. Mayhew; "A"—G. Keeley. Three "Bluebirds": RE and SZ in commission UH serviceable in reserve.

Flying time:—7 hrs. 30 mins.; 7 members were given dual instruction (3 hrs. 30 mins.). Flights were made by four "A" and "B" pilots (1 hr. 20 mins.). 19 passengers were carried (2 hrs. 15 mins.). Eight test flights were made (40 mins.).

High winds and rain have rendered conditions none too suitable for pupils.

On Sunday a local motor-cycle club made the aerodrome the objective of a social run. A large number of their members took the opportunity of going for a flight.

On Monday an Imperial Airways D.H.50 fought its way through the mist to Hadleigh carrying press representatives to the scene of the explosion at Bramble Island. A press photographer chartered one of the "Bluebirds" and flew over the works with Mr. Lowdell to take photographs.

YORKSHIRE AEROPLANE CLUB

REPORT for week ending October 13.—Flying time, 19 hrs. 40 mins. Instruction, 8. Time, 6 hrs. 15 mins. Soloists, 2. Time, 30 mins. "A" Pilots, 12. Time, 12 hrs. 30 mins. Passengers, 1. Time, 10 mins. Tests, 3. Time, 15 mins. Machines in Commission, 2. Chief Instructor, Capt.

G. R. Beck. Ground Engineer, R. Morris. Assistant Ground Engineer, T. Houghton.

A wet, miserable week, with very limited activities in consequence.

REPORT for week ending October 20.—Pilot Instructor: Capt. G. R. Beck, Chief Ground Engineer: Mr. R. Morris. Assistant Ground Engineer: Mr. T. Houghton. Machines in commission: Two (G-EBTB and G-EBSV). Flying time for the week: 16 hrs. 10 mins. Instruction: 7 (5 hrs. 30 mins.). Soloists: 3 (1 hr. 5 mins.). "A" Pilots: 8 (8 hrs. 30 mins.). Passengers: 6 (1 hr.). Tests: 2 (10 mins.).

Mr. P. Dujardin has obtained his Air Ministry "A" licence.

Our ground engineer, Mr. R. Morris, has been granted his category "D" licence.

A successful Whist Drive was held in the club house on Wednesday, October 17. The numbers attending were small, but a very pleasant evening was spent and £7 cleared towards the provision of a dance floor for the club house. It is hoped to repeat this in the near future.

FROM THE FLYING SCHOOLS

Henderson Flying School, Brooklands Aerodrome

REPORT for week ending October 11.—Total flying time, 21 hrs. 55 mins.

In spite of the approach of wintry weather, a number of pupils have joined us during the last week, their names being:—Messrs. Eggar, Enser, Bramwell, Ford, Koratkar, and Commander Bower.

On October 5, the school provided five machines of various makes for a cinematograph stunt, which provided considerable amusement to the participants, in spite of a number of unavoidable delays.

Mr. J. L. May's Mono. Avro has now been completed, and is proving a great success.

REPORT for week ending October 18.—Instructors: Lieut. Col. G. L. P. Henderson, Capt. H. D. Davis. Ground Engineers: A. A. Anderson, W. A. Watts. Number of machines in commission: Two (Mono Avro G-AACA, Renault Avro G-EBVE). Flying time for the week, 14 hrs. 50 mins.

Number of pupils under instruction, 24 (hours flown 7.50). Number of soloists, 8 (hours flown 5.55). Number of "A" Pilots flying, 4 (hours flown 3.15). 26 passengers carried (hours flown 1.5). Two tests, (hours flown 30 mins.

New Pupils:—Messrs. Barnwell, Ford, Eggar, Richardson, Koratkar.

Mr. S. S. Daniel, who is undergoing his tests for his "B" licence, carried out his height test satisfactorily, and Mr. Eugene Hsiao has now nearly completed all his solo flights for his "B" licence, the tests for which he will undergo at an early date.

The De Havilland Flying School, Stag Lane Aerodrome

REPORT for week ending October 14.—Total flying time, 61 hrs. 25 mins. Instruction (dual), 19 hrs. 35 mins.; solo, 32 hrs. 45 mins. Other flying, 9 hrs. 5 mins.

Two pupils passed their night-flying tests for "B" licence, one being Mr. Roushdy of the Civil Aviation Department of Egypt.

On Monday we had a surprise visit from the Secretary of State for Air, The Rt. Hon. Sir Samuel J. G. Hoare, Bart., C.M.G., M.P. He was most interested in the Stag Lane private owners' garage, and the "Moth" production departments, both of which, he said, spoke volumes for the future of private flying.

On Wednesday, Colonel Fitzmaurice, of the Irish Free State Air Force, "dropped" into the aerodrome on the first Irish civil aeroplane. He watched a Gipsy "Moth" in action and was greatly impressed with its performance.

The *Daily Mail* have now taken delivery of their new D.H.61, and one looks forward to its safe accomplishment of many thrilling flights.

Among new "Gipsy" Moth owners we are pleased to welcome Capt. Malcolm Campbell, the well-known racing motorist. We understand that Capt. Malcolm Campbell is to use his "Moth" for observation work in connection with finding a "speedway" for his proposed attack on the motor speed record.

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AIRISMS FROM THE FOUR WINDS

The Portuguese Flight to Africa

THE two Portuguese airmen, Capts. Pais Ramos and Oliviera Vieges (accompanied by Lieut. Esteres and Sergt. Antonio), who are engaged in a flight from Lisbon to Mozambique in two Vickers "Valparaiso" biplanes (Napier "Lion"), continued their flight from Port Gentil to Point Noir (404 miles) on October 2. They reached Loanda (354 miles) the following day, and during their stay there met Lady Bailey, who is on her return flight to England. The Portuguese airmen proceeded on October 9, flying 310·7 miles to Benguela in 2 hrs. 4 mins. On October 11 they covered another 310 miles to Silva Porto (Huambo).

Cape Town Airman's Mishap

FLIGHT-LIEUT. P. MURDOCH, the S. African pilot who flew to Cape Town from London in record time recently, crashed at Elizabethville, Belgian Congo, on October 18, in the course of his return flight. His machine, an Avro "Avian" (Cirrus) was destroyed, but he was uninjured. He started September 12.

Sir Philip Sassoon's Cruise

ON October 18, Sir Philip Sassoon reached Simla in the course of his tour of inspection of R.A.F. units in India. He left Simla for Lahore on October 21, and inspected the large aircraft park. He then flew to Peshawar in a twin-engined Handley Page "Hinaidi," escorted by three D.H.9A's. The next stage will be to Quetta. He was expected at Karachi on October 24.

Record Light 'Plane Flight to Berlin

ON October 19, Capt. N. Stack, test pilot to the A.D.C. Aircraft Co., Ltd., Croydon, flew from London to Berlin in an Avro "Avian" (A.D.C. "Cirrus Mk. III") in 4 hrs. 52 mins. The distance is approximately 600 miles. This time has never been equalled by any other light 'plane over the same direction and only once beaten by any aircraft. Capt. MacIntosh flew it once in a D.H.50 in six minutes less time than Capt. Stack took. The purpose of the latter's flight was to deliver some important instructions at the Berlin Aero Show.

Lady Bailey Resumes

THE trouble which has delayed Lady Bailey on her return flight in the D.H. "Moth" (Cirrus) from South Africa along the west coast route has been overcome, and she resumed her flight from Loanda on October 19, and reached Boma, in Belgian Congo. The next stage is Leopoldville. Incidentally, we are pleased to state that Sir Abe Bailey is now reported to be progressing favourably.

Lieut R. R. Bentley Returning

LIEUT. R. R. BENTLEY, A.F.C., and his wife, recently concluded their long stay in this country, which was partly occupied by the former in acting as the first instructor to the new Liverpool Aero Club. On October 19 they left Croydon in their D.H. "Moth" (Cirrus) for the return flight to South Africa, a stage covered twice by Lieut. Bentley already, and once by his wife. The same machine and engine is being used. A new route is proposed this time, which will touch Constantinople, instead of crossing the Mediterranean, and then link up again with the blazed trail at Cairo.

Montreal Air Port

A MODERN air harbour is to be constructed in Montreal, situated in the vicinity of Canadian-Vickers' plant, with an area of 4,000 ft. by 2,000 ft., for mooring planes. Fairchild aircraft will now be constructed, not under licence, but in their own factory at Grandwere, Quebec.

Greece Assists London-India Air Line

THE Greek Government has given permission for air ports to be established in Greek waters for the London-India air route. A survey party is shortly to survey the Mediterranean for the scheme. Short "Calcutta" flying boats will be flown on this section.

Rome-Barcelona Air Line

FOUR Dornier "Superwal" flying-boats, of 2,000 h.p. each, will operate the new air service between Rome and Barcelona, which commences on October 28. Genoa will be the place of call, and also Palma (Majorca) and Cerdena on the return flights.

601 Squadron (A.A.F.) Wins Again

THE Esher Trophy, awarded for yearly presentation to the most efficient squadron of the Auxiliary Air Force, has again been won by 601 County of London Squadron, commanded by Sqdn. Ldr. Lord Edward Grosvenor. This is the second time the squadron has been successful.

Interplanetary Flight

MONSIEUR ROBERT ESNAULT-PELTERIE, one of the foremost pioneers of French aviation and a member of the Royal Aero Club, will give an illustrated lecture at the Royal United Service Institution, Whitehall, S.W.1, on Wednesday, October 31, at 8.30 p.m. The subject of the lecture is "The Exploration of the Upper Atmosphere by Rockets and the Possibility of Interplanetary Flight." Admission to the lecture is free and application for tickets should be made to the Secretary, Royal Aero Club, 3, Clifford Street, London, W.1.

FLIGHT

THE NEW PALMER AIRCRAFT BRAKE

Light Weight and Pneumatic Operation

SHOWN to the public for the first time at the Berlin Aero Show, the new wheel brake for aircraft which has just been produced by The Palmer Tyre, Ltd., of 100-106, Cannon Street, London, E.C.4, is entirely different from anything hitherto put on the market, and incorporates certain features which should reduce to vanishing point nearly all the difficulties that are met with in designing wheel brakes for aircraft. The fundamental principle of the new Palmer wheel brake is exceedingly simple, and consists in interposing between the fixed drum and the moving drum an annular inflatable member carrying a number of brake blocks.

Our sketches, obtained from one of the demonstration wheels exhibited at Berlin, will probably make the design of the brake clear. The wheel itself has been re-designed to carry the two brake drums. The inner drum is fixed to the outer portion of the hub, which in turn is fixed to the wheel axle and does not rotate. The outer drum is attached to the rotating hub and also, by tangential spokes, to the rim of the wheel, and rotates with the wheel.

Interposed between the two drums is the inflatable member, which takes the form of a flattened air tube carrying on its outside circumference a number of brake blocks. These blocks are stepped into recesses in the fixed drum, thereby being prevented from revolving around the drum. It will be seen that when air is forced into the flexible tube the tube expands, and in so doing brings the brake blocks into contact with the outer, rotating, brake drum, the amount of friction depending upon the air pressure in the tube.

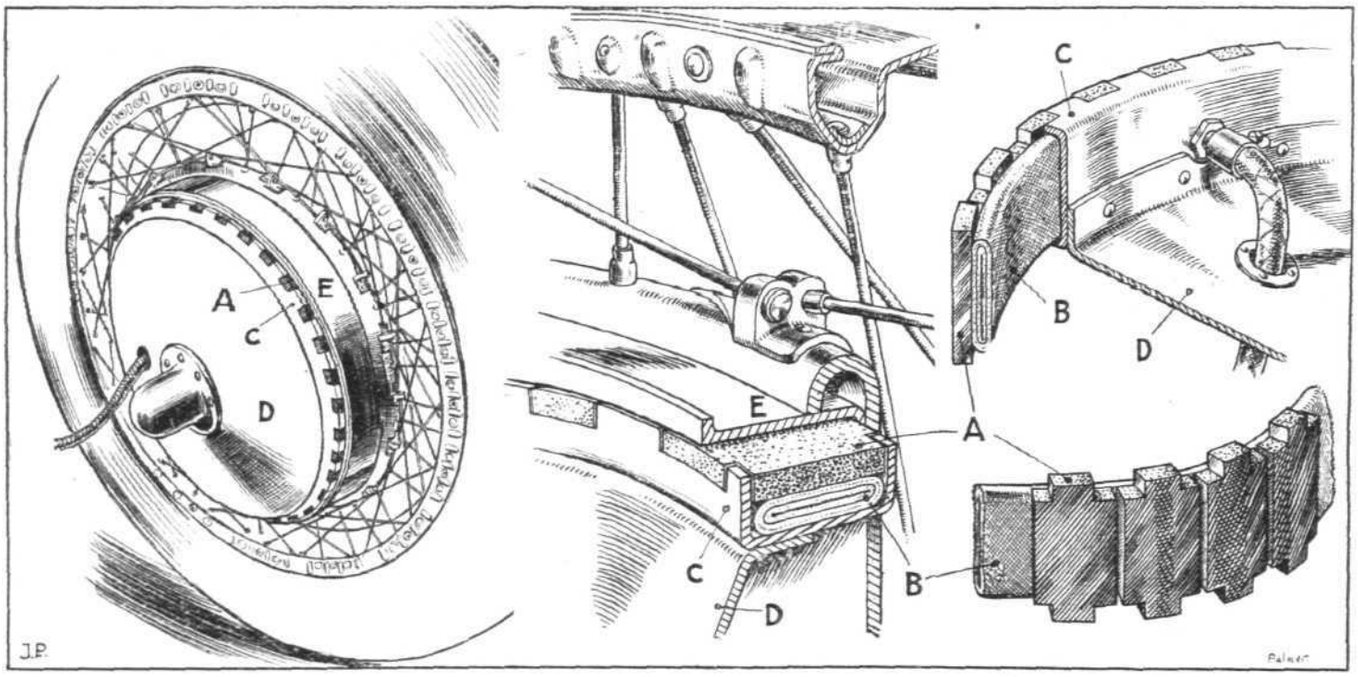
It is claimed for this arrangement, and appears obvious, that the drum distortion which may take place when internal expanding two-shoe or three-shoe brakes are employed is entirely avoided, as the tube to which the brake blocks are attached "breathes" in sympathy with any slight irregularities in the drums.

For operating the brake blocks two distinct systems are available. For large machines, not already fitted with air compressors, an air cylinder of special design is provided. This is flexible, and consists of a rubber cylinder reinforced with Palmer cord, and is claimed to be at least equal in strength to steel cylinders, although having but a fraction of their weight. The air is transmitted from this cylinder to the air tube *via* a relay valve, foot-operated. No effort is required for operating this valve, and yet it enables the pilot to retain the "feel" of his brake and to release the brake pressure as gradually as it was applied.

For use on small machines, the air cylinder can be dispensed with altogether, the pilot in this case providing the air pressure direct by means of a foot-operated plunger. In that case, of course, the relay valve is also omitted. It has been found that the air pressure necessary for even a very considerable brake effect is very small, and that it may easily be provided by such simple means as a small cylinder in which the piston or plunger is depressed by the pilot's foot.

In fact, on one of the demonstration wheels at the Berlin Show, the pressure is no more than that which can be applied by squeezing an ordinary car type horn bulb. Yet the braking effect is quite considerable.

We have not as yet available any actual figures relating to the weight of the new Palmer aero wheels with brakes, but it is quite obvious that the amount of weight which has been added is quite negligible, and it should not be long before the new Palmer brake is seen on large number of aircraft, both small and large.



["FLIGHT" *Sketches*

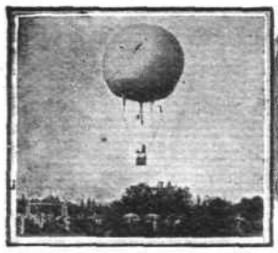
THE NEW PALMER WHEEL BRAKE FOR AIRCRAFT: On the left a sketch of the special wheel, with letters indicating the location of details shown in the other two sketches. The outer end of the hub is fixed to the axle as is also the cupped disc D, which carries a trough C in which the brake element is accommodated. This takes the form of a flattened air tube B carrying the friction blocks A, which are prevented from slipping in the trough by being notched into the castellations of C. When air is pumped into the tube B, this expands, and the outer surfaces of the friction blocks A are made to bear on the drum E, which travels around with the main wheel. Being pneumatically operated, the brake cannot apply pressure unevenly to the drums C and E.

Whose?

Two French fishing trawlers "caught" a Renault engine in their trawl off Collioure, near Perpignan, thought to belong to a machine which was lost at sea in 1923 when flying between Africa and France.

LZ. 127's Bearings

DURING her recent flight across the Atlantic, from Friedrichsafen to Lakehurst, N.J., the "Graf Zeppelin" (LZ. 127) took a very large number of bearings, which no doubt assisted her in getting safely across. These bearings, of which there were some 465, were of the ball and roller type, of course! They were supplied by the Skefko Ball-Bearing Co., Ltd., the manufacturers of the well-known "SKF" ball and roller bearings.



AIRSHIPS

THE GOODYEAR "PURITAN"

A Small American Non-Rigid Airship

THREE years ago the Goodyear Tyre and Rubber Co., of Akron, Ohio, constructed an interesting little sporting airship, called the "Pilgrim" (see FLIGHT for May 6, 1926). Just recently, the Goodyear Zeppelin Corp. which is a subsidiary of the Goodyear Tyre and Rubber Co., launched their first airship, the "Puritan," a new and improved version of the "Pilgrim." We are able this week to give some brief particulars and an illustration of this new airship.

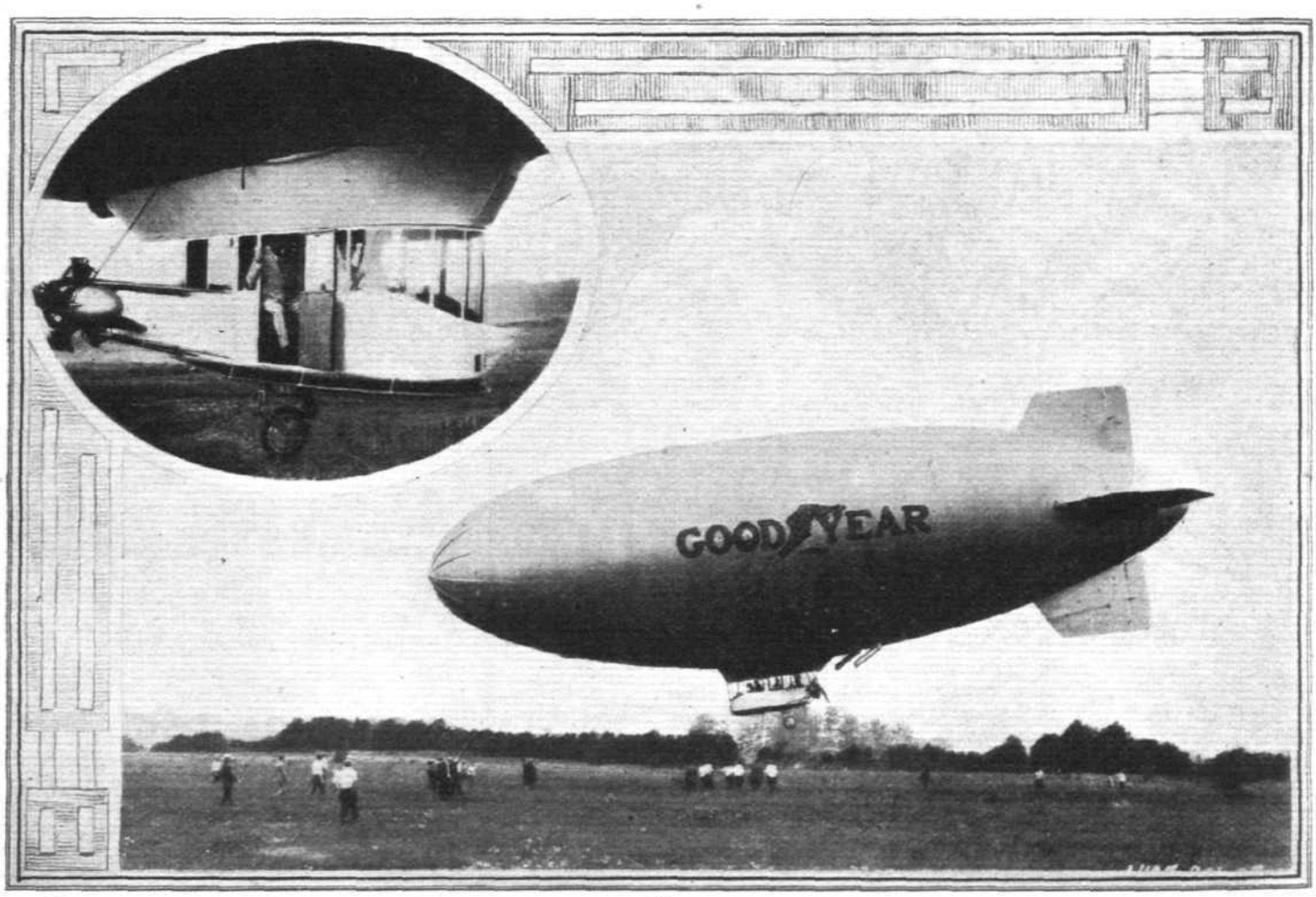
The "Puritan" is a marked advance on the "Pilgrim" in that it is somewhat larger and has a wider cruising range, higher speeds and greater lifting capacity. Powered with two radial air cooled-engines, the "Puritan" has a cruising speed of 46 m.p.h., a maximum speed of 55 m.p.h., and a cruising radius, with two passengers and pilot, of 550 miles. With four passengers, the ship has a radius of 350 miles, and it has carried as many as six passengers.

It has a length of 128 ft., a maximum diameter of 37 ft., and has a capacity of 86,000 cub. ft. of helium. The car, which is totally enclosed, is mounted close up, and flush with, the envelope (as in the "Pilgrim"). The two engines, which are air-cooled radials of the latest design, are mounted on outriggers from the rear of the car to eliminate noise and vibration—the "Pilgrim" had a single engine mounted direct on the car.

Amongst the improvements on the "Pilgrim"—which was 110 ft. long, 30 ft. diameter, and of 53,000 cub. ft. capacity—are a strong keel within the envelope attaching the car to the envelope, a second rudder on the top fin for additional manœuvrability, and dual controls. A single swivelling "landing" wheel is also mounted below the car. The engines are equipped with automatic starters, and are geared to revolve the propellers in opposite directions, thus reducing the torque in the car, besides increasing the ship's stability and manœuvring capacities. Incidentally, it may be added, the ship can fly on one engine.

Dr. Karl Arnstein, formerly chief engineer of the German Zeppelin Co., and now associated with the Goodyear-Zeppelin Corp., was in charge of the design and development of the "Puritan." This interesting little ship will be used for experimental purposes, cross-country flying, and the training of students in the Goodyear airship school.

It may be noted, in conclusion, that Commander J. C. Hunsaker—formerly chief of the design division of the Bureau of Aeronautics, U.S. Navy, and associated with the design of the "Shenandoah" and certain non-rigid airships—has been elected Vice-President of the Goodyear-Zeppelin Corp. He will be engaged in research and development of commercial relations in connection with airship manufacture by Goodyear-Zeppelin, and will be associated in his work with Dr. Arnstein, who is also a Vice-President of the Corporation.



THE GOODYEAR "PURITAN": This small non-rigid airship was recently launched by the Goodyear-Zeppelin Corp. of Akron, Ohio. It is 128 ft. long and is fitted with two air-cooled radial engines. Inset is a view of the car, seated in which is P. W. Litchfield, President of the Goodyear companies.

FLIGHT
AIRCRAFT ENGINEER AND AIRSHIPS

THE ROYAL AIR FORCE

London Gazette, October 16, 1928

General Duties Branch

The follg. are granted short service comms. as Pilot Officers on probation with effect from and with seniority of October 12 :—M. H. Ballantyne, R. J. T. Barrett, J. Cherrill, D. H. V. Craig, E. J. Finnegan, T. Gadd, R. P. Garnons-Williams, C. R. J. Hawkins, M. T. M. Hyland, J. O. H. Lobley, L. T. Milner (Sec. Lieut., 5th Battn., K.O.Y.L.I., T.A.), B. A. Oakley, P. B. Rogers, J. D. H. Slade, J. R. Stebbing, A. T. Wilson, D. A. Woolfe, A. N. I. Worger-Slade.

The follg. are granted temp comms. as Flying Officers on seconding for four years' duty with the R.A.F. (October 2) :—Lieut. F. J. P. Dewhurst, Royal Tank Corps ; Sec.-Lieut. A. J. W. Geddes, R.A.

Pilot Officer E. C. Lewis is promoted to rank of Flying Officer (July 10) ; Pilot Officer R. Brown is promoted to rank of Flying Officer with effect from August 15, and with seniority of June 11 ; Pilot Officer J. R. Mutch is promoted to rank of Flying Officer with effect from September 11 and with seniority of June 11; Pilot Officer F. D. Biggs is promoted to rank of Flying Officer with effect from August 15, and with seniority of June 11 (substituted for *Gazette* September 11).

Pilot Officer J. A. H. Louden resigns his permanent commission (October 17). The short service commn. of Pilot Officer on probation G. R. Chameroy is terminated on cessation of duty (September 22) (substituted for *Gazette* September 25).

Medical Branch

The follg. are granted short service commns. as Flying Officers for three years on active list, with effect from and with seniority of Oct. 2 :—J. L. Groom, N. M. Jerram, G. W. Paton, M.B., R. W. N. Robins, B.A., M.B. (since deceased) G. O. Williams, B.Sc. Flying Officer P. B. L. Potter, M.B., ceases to be seconded to Princess Alice Memorial Hospital, Eastbourne (October 2).

Chaplains Branch

The Rev. J. H. Ogilvie, M.A., is granted a short service commn. as a Chaplain, with the relative rank of Squadron Leader (October 10).

General Duties Branch

Pilot Officer on probation J. Reekie is confirmed in rank (October 11) ; Flying Officer C. H. L. Needham is transferred from Class AA to Class B (August 13) ; Flying Officer B. S. Wilcox, D.F.C., is transferred from Class A to Class C (September 24) ; Pilot Officer W. D. Brookes resigns his commn. (September 14) ; Flying Officer L. S. Webb relinquishes his commn. on completion of service (October 13) ; the commn. of Pilot Officer on probation R. M. Clarkson is terminated on cessation of duty (September 25).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Group Captain.—H. R. Busteed, O.B.E., A.F.C., to No. 482 Flight, Cattewater, to command, 8.10.28.

Squadron Leader A. D. Pryor, to No. 1 Indian Group, H.Q., 4.10.28.

Flight Lieutenants: J. McBain, D.F.C., to No. 1 Indian Group, H.Q., 4.10.28. H. Hackney, to School of Naval Co-operation, Lee-on-Solent, 1.8.28. H. W. St. John, D.F.C., to R.A.F. Base, Calshot, 13.10.28. G. C. Gardiner, D.F.C., to R.A.F. Depot, Uxbridge, 10.10.28. W. H. Markham, to R.A.F. Station, North Weald, 15.10.28. O. E. Worsley, to R.A.F. Depot, Uxbridge, 10.10.28. W. Wynter-Morgan, M.C., to H.Q., Air Defence of Great Britain, Uxbridge, 16.10.28. J. B. P. Angel, to R.A.F. Depot, Uxbridge, 19.9.28. H. G. Brookman, to R.A.F. Depot, Uxbridge, 28.8.28. B. Ankers, D.C.M., to No. 11 Sqdn., Netheravon, 2.10.28. A. R. Jones, to R.A.F. Depot, Uxbridge, 1.10.28. R. C. Wansbrough, to R.A.F. Depot, Uxbridge, 9.10.28. W. C. Yale, to R.A.F. Depot, Uxbridge, 9.10.28. V. Buxton, O.B.E., to R.A.F. Station, Kenley, 18.10.28. J. Whitford, to No. 502 Sqdn., Aldergrove, 15.10.28. H. A. Haines, D.F.C., to R.A.F. Depot, Uxbridge, 8.10.28. R. J. Montgomery-Moore, to No. 22 Group H.Q., S. Farnborough, 1.12.28.

Flying Officers: B. S. Brice, A.F.C., to Home Aircraft Depot, Henlow, 8.10.28. R. F. J. Strange, to R.A.F. Transjordan and Palestine H.Q., on appointment to a Short-Service Commn., 29.9.28. E. R. H. Coombes, to R.A.F. Depot, Uxbridge, 27.10.28. H. D. Gunton, to R.A.F. Base, Calshot, 17.10.28. J. E. Preston and H. Thomas, to R.A.F. Depot, Uxbridge, 24.9.28. H. T. Messenger, to R.A.F. Depot, Uxbridge, 21.9.28. G. W. R. Russell, to No. 2 Flying Training Sch., Digby, 19.9.28. J. E. Clayton, to No. 111 Sqdn., Hornchurch, 22.10.28. C. R. Cubitt, to No. 43 Sqdn., Tangmere, 22.10.28. V. C. Taylor, to No. 56 Sqdn., North Weald, 15.10.28. E. G. Cayley, to No. 19 Sqdn., Duxford, 17.10.28. W. J. H. Lindley, to No. 19 Sqdn., Duxford, 17.10.28.

Pilot Officers: N. A. Pearce, to No. 12 Sqdn., Andover, 9.10.28. The undermentioned Pilot Officers are posted to the R.A.F. Depot, Uxbridge, on appointment to Short-Service Commns. (on probation), with effect from 12.10.28 :—M. H. Ballantyne, R. J. T. Barrett, J. Cherrill, D. H. V. Craig, E. J. Finnegan, T. Gadd, R. P. Garnons-Williams, C. R. J. Hawkins, M. T. M. Hyland, J. O. H. Lobley, L. T. Milner, B. A. Oakley, P. B. Rogers, J. D. H. Slade, J. R. Stebbing, A. T. Wilson, D. A. Woolfe, and A. N. I. Worger-Slade.

Stores Branch

Flight Lieutenants: G. A. Curtis, to Air Ministry (Directorate of Equipment), 22.10.28. S. D. Dennis, to R.A.F. Depot, Uxbridge, 8.10.28. T. J. Organ, to No. 3 Stores Depot, Milton, 11.10.28. J. R. Gardiner, to Air Ministry (Directorate of Equipment), 12.9.28.

Flying Officer P. H. Burt, to No. 1 Sch. of Tech. Training (Apprentices), Halton, 22.10.28.

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THE ROYAL AUSTRALIAN AIR FORCE

Wapiti Selected as General Purpose Machine

By MAJOR F. A. de V. ROBERTSON

It is now possible to announce that the authorities of the Royal Australian Air Force, after careful consideration of the merits of various types, have decided to adopt the Westland Wapiti with Jupiter VIII engine as their standard General Purpose aeroplane. An order for 28 Wapitis with metal fuselage and wooden wings, ailerons, tail planes, elevators and fins, is being placed with the Westland Aircraft Works of Yeovil, Somerset. This firm, and also the Bristol Aeroplane Co., Ltd., are to be heartily congratulated on this important order. Not only is it substantial in itself, but it is also significant. The R.A.A.F. is the only overseas British air force which so far has requested and received the advice of an experienced and senior officer of the R.A.F. on its re-organisation and re-equipment. It is, in fact, the only overseas force which is making a real effort to put itself on an actual war footing.

Perhaps that last statement ought to be qualified, as forces which expect to encounter enemy air forces do not use the General Purpose type of aeroplane. In so-called European warfare aircraft equipment must be specialised. The squadrons which deal with fighting, day-bombing, night-bombing, reconnaissance and photography, army co-operation, communications, etc., all need specialised types of aeroplane. But when no enemy aircraft are to be expected, then there is every reason to use the General Purpose type. It can be used, with comparatively slight variations of equipment, for nearly all the above-mentioned purposes, while the advantages of having to provide only one type of spares for a number of squadrons is obvious.

The R.A.F. overseas has until quite lately used mainly two types of aircraft—apart from troop-carriers, ambulance and training machines—namely, the Bristol Fighter for army co-operation squadrons and the D.H.9A for bombing squadrons. Gradually the D.H.9A is being replaced by General Purpose machines, which are quite able to do army co-operation work as well as all the bombing which is likely to be needed in the Middle East, Iraq and India.

No. 47 Bombing Squadron at Khartum has for some time past been equipped with Fairey III F machines. No. 84 B.S. at Shaibah has received Wapitis, and two of the squadrons in India (or soon to proceed there) are, it is understood, also to receive Wapitis. It is not at all improbable that the army co-operation squadrons overseas will also change over to General Purpose aeroplanes in due course.

The Royal Australian Air Force is no nearer to engaging in a "European" war than are the R.A.F. commands overseas, and therefore the choice of a General Purpose machine for a great part of their work is obviously sensible. Mr. Bruce has, however, accepted in full the report and recommendations of Air Marshal Sir John Salmond, and those recommendations do not stop short at the General Purpose machine. From cabled summaries it appears that within nine years the following units are to be added to the existing force of the Commonwealth :—One army co-operation squadron, two bombing reconnaissance squadrons, two coast reconnaissance flights of boats, two flights of single-seater fighters, three slipways for flying-boats, one stores depot, one recruits training section, one Wing headquarters, and a cadets' training Wing at Duntroon College. In addition to this, the report recommends one citizen air force squadron confined to one service type of aircraft, as well as torpedo-bomber machines for coastal defence and other flying-boats to act as anti-submarine patrols and for escorting long sea reconnaissance patrols. These recommendations are said to involve a capital expenditure of just under £2,000,000, including £1,250,000 for equipment and an annual charge of £1,139,000.

It will, we think, be extremely interesting to see the details of the report when it reaches this country. It appears, however, that the decision to order 28 Wapitis (presumably the equipment for two squadrons) was made before Sir John Salmond's report was published, and certainly before it was accepted. It looks as if the number of Wapitis will have to be increased considerably in the not distant future.

FAIREY AVIATION COMPANY'S SOCIAL

ON October 5 was held the Fairey Aviation Company's Annual Social and Athletic Club Dinner, in the new canteen at their works in Hayes, Middlesex.

In some ways the dinner was in the nature of a double event, as the dinner that had been arranged at the beginning of the year for the distribution of the prizes won during the preceding period had had to be postponed owing to the illness of the President—Mr. C. R. Fairey. In view of this, the prizes for both the current and preceding year were distributed on October 5.

Mr. C. R. Fairey, in proposing the toast of "The Club," congratulated it on its successful activities and rapid expansion. He recalled how last year he had given them a tip for Flight-Lieut. Webster's victory in the Schneider Cup, and he was again going to offer one further tip. He thought that there was a machine at Northolt which was very secret, so secret, in fact, that it was not even on the Secret List! He could not tell them anything about it, but there was quite a fair chance of another world's record coming to England in the course of the next few months. In conclusion, on behalf of himself and his fellow directors, he said they would be only too pleased to lend their full support to the Sports Club and to help to extend its activities in other directions. He also congratulated the club on the possession of its hard-working secretary, Mr. G. C. Owers.

Mr. Owers, in reply, gave a short history of the activities of the various sections of the club during the past year, which included tennis, cricket, football, badminton, etc., all of which had had enthusiastic support. On behalf of the club he thanked Mr. Fairey and the directors for their great interest in its progress, and mentioned that the very satisfactory financial position was largely due to their generosity.

The new sports field was in full swing, and the use of the canteen hall was enabling new indoor events to be undertaken. A member of the Club's Executive Committee, Mr. J. Ayers, then rose and proposed the health of the President, Mr. C. R. Fairey, coupled with that of Mrs. Fairey, a toast which was drunk with great pleasure and enthusiasm. Speeches were short to enable Mrs. Fairey to proceed with the presentation of the numerous prizes which had been won during the previous two seasons, and the evening was concluded with a most enjoyable concert, and all voted the dinner a most successful affair. The following were among those present:—Mr. C. R. Fairey (Chairman and Managing Director), Mrs. Fairey, Mr. J. F. Chapman, Mrs. Chapman, Major T. M. Barlow (Chief Engineer), Mr. A. G. Hazell (Secretary), Mr. W. Broadbent (Works Manager), Capt. N. MacMillan (Chief Pilot), Mr. M. Lobelle (Chief Designer), Mr. P. A. Ralli (Chief of Technical Dept.), Mr. Wickham (Resident A.I.D. Inspector), Mr. Walmsley (Assistant Works Manager), Mr. McPherson (Publicity Dept.), Mr. E. Tips (Engineering Staff), Mr. G. Owers (General Sports Secretary), Mrs. Owers.

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THE WESTLAND AIRCRAFT SOCIETY

THE Westland Aircraft Society (Yeovil Branch of the R.Ae.Soc.) is making good progress and has just completed a successful session. A series of 8 lectures were given during this last session. The membership of the Society is also increasing.

Some 24 lectures and visits are included in the syllabus for the 1928–29 session. Six lectures have already been given—three on "Ground Engineers' Duties," by Mr. W. G. Gibson and Capt. F. Mayer, "Compass Swinging," by Mr. N. Pitcher, and "Timber," by Mr. T. Carey. The remaining lectures, etc., are as follows:—

Oct. 22, 1928.—"Britain's Position in World Aviation," by Brig.-Gen. P. R. C. Groves (Assembly Rooms).

Oct. 25-27.—Showing of instructional film, "Bristol 'Jupiter' Engines and Westland 'Wapiti' Aircraft" (Central Cinema).

Nov. 2.—"Steel Tubing Manufacture and Manipulation," by Mr. W. Hackett.

Nov. 7.—"Armstrong-Siddeley Aero Engines," by Maj. F. M. Green.

Nov. 14.—"Screw Threads," by Mr. W. Harmer.

Nov. 21.—"Steel Works," by Mr. A. J. Croft.

Nov. 30.—"Napier Aero Engines," by Mr. W. Lind-Jackson.

Dec. 5.—"Evolution, Care and Maintenance of Engineers' Small Tools," by Mr. T. Dickinson.

Jan. 4, 1929.—"The Cairo–Baghdad Air Mail," by Wing.-Comdr. R. M. Hill.

Jan. 7.—"Jupiter Engines," by Representative of Bristol Aeroplane Co.

Jan. 18.—"The Slotted Wing," by Mr. F. Handley Page.

Jan. 23.—"Experimental Flying," by Flight-Lieut. R. L. Ragg.

Jan. 30.—"The A.I.D.," by Maj. P. Bishop.

Feb. 6.—"Cirrus Aero Engines," by Representative of A.D.C. Aircraft, Ltd.

Feb. 15.—"Experiments on Model Aerofoils, etc.," by Mr. E. G. Richardson.

Feb. 20.—"Seaplane Developments," by Maj. J. H. Ledeboer.

Feb. 25-27.—Showing of instructional film, "The Heart of a Lion" Central Cinema).

Mar. 9.—Visit to works of Whitehead Torpedo Co., Ltd., Weymouth.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1156 (*Ae.* 321).—On the Flow of a Compressible Fluid Past an Obstacle. By Dr. H. Lamb. April, 1928. Price 4*d.* net. *No.* 1158 (*Ae.* 323).—The Effect of The Static Pressure Gradient on the Drag of a Body Tested in a Wind Tunnel. By H. Glauert. March, 1928. Price 9*d.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

Oxford Forestry Memoirs, No. 9, 1928.—Aerial Survey in Relation to the Economic Development of New Countries, with Special Reference to an Investigation Carried out in Northern Rhodesia. By R. Bourne. Clarendon Press, Oxford.

The Siskin III A. Aeroplane: Jaguar Engine. Air Publication 1317. H.M. Stationery Office, Kingsway, London, W.C.2. Price 1*s.* net.

British Rainfall: 1927. Meteorological Office—Air Ministry. H.M. Stationery Office, Kingsway, London, W.C.2. Price 15*s.* net.

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IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910.)

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1927 being given in FLIGHT, January 19, 1928.

	Imports.		Exports.		Re-Exports.	
	1927.	1928.	1927.	1928.	1927.	1928.
	£	£	£	£	£	£
Jan. ..	1,850	1,220	49,021	157,598	—	330
Feb. ..	679	1,772	63,080	118,622	—	345
Mar. ..	7,087	4,805	106,478	125,901	2,270	1,307
April ..	822	2,904	71,190	134,126	785	3
May ..	1,258	2,513	82,708	118,804	640	640
June ..	1,249	5,916	149,907	86,245	162	1,317
July ..	1,798	2,025	104,167	108,746	750	521
August	2,453	2,566	78,742	97,303	—	100
Sept.	2,045	4,240	61,946	72,475	59	3,183
	19,241	27,961	767,239	1,019,820	4,666	7,746

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NEW COMPANY REGISTERED

AIRWORK, LTD.—Capital £45,000, in £1 shares. Manufacturers of and dealers in aeroplanes, flying machines, airships and aerial conveyances of all kinds, and the component parts thereof, garage and hangar keepers, aerodrome proprietors, cinematograph proprietors and film makers, etc. First directors: H. N. St.Valery Norman, F. A. I. Muntz. Secretary: F. A. I. Muntz. Solicitors: Pettit, Walton and Co., Leighton Buzzard.

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AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1927

Published October 25, 1928

17,387. BOULTON AND PAUL, LTD., and J. D. NORTH. Apparatus for assembling girders, spars, etc. (297,874.)

APPLIED FOR IN 1928

Published October 25, 1928

1,731. SIR C. J. Q. BRAND. Gun-mountings for aircraft. (298,019.)

13,199. H. and M. FARMAN. Lubricating-device for i.c. engines. (290,287.)

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